ミャンマー国

ミャンマー国
ティラワ経済特別区(SEZ)整備事業準備調査
報告書
（公開版）

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Appendix A: Strategic Environmental Assessment (SEA) for Thilawa SEZ Development Project (2,000 ha)

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［略語表］

略語表（環境社会配慮部分）

略語	英名	和名
CEO	: Community Engagement Officer	-
CSR	: Corporate Social Responsibility	: 企業の社会的責任
ECD	: Environmental Conservation Department	: 環境保全局
EIA	: Environmental Impact Assessment	: 環境影響評価
EMP	: Environmental Management Plan	: 環境管理計画
GAD	: General Administration Department	-
GHG	: Greenhouse Gas	: 地球温暖化ガス
IEE	: Initial Environmental Examination	: 初期環境調査
IUCN	: International Union for Conservation of Nature	: 国際自然保護連合
JICA	: Japan International Cooperation Agency	: 国際協力機構
MOECAF	: Ministry of Environmental Conservation and Forestry (Myanmar)	: 環境保全林業省（ミャンマー)
NGO	: Non-Governmental Organization	: 非政府組織
OSSC	: One Stop Service Centre	: ワンストップサービスセンター
SEA	: Strategic Environmental Assessment	: 戦略的環境アセスメント
SEZ	: Special Economic Zone	: 経済特区
SIA	: Social Impact Assessment	: 社会影響評価
TSEZMC	: Thilawa SEZ Management Committee	: ティラワ経済特区管理委員会

1 序章

1.1 調査の背景

ミャンマー連邦共和国（以下「ミャンマー」）は長年、国際的な孤立により経済発展が制約されてきたが、2011 年 3 月のテイン･セイン政権発足後、民主化･市場経済化に向けて急速な進展を見せている。ミャンマー政府は、経済成長を通じた国民の所得向上を実現する上で、海外直接投資の誘致を重視しており、特にティラワ、ダウェイ、チャオピュー等の経済特別区（以下「SEZ」）開発による外国企業誘致促進を方針として掲げている。ミャンマー政府は経済発展を実現する上で海外直接投資の誘致を重視しており、新政権発足後徐々に関連の法制度等の改訂準備を行ってきている。外国企業誘致に関する外国投資法については国会審議を経て 2012 年 11 月に成立し、ミャンマー特別経済地域（SEZ）法についても 2013 年 7 月中旬に改正法案が下院で可決された。

ティラワ SEZ は、ヤンゴン市に隣接し、タンリンタウンシップ及びチャウタンタウンシップにまたがる開発予定面積約 2,400ha の区域であり、豊富な労働力、既存の産業集積、港湾施設へのアクセスが利点である。SEZ 建設予定地は、外周に沿って舗装道路が南北東西に整備されつつある。しかし、SEZ の内側は湿地や水田・畑地のまま残されており、企業進出を促進するためには、給水施設等 SEZ 内や周辺部のさらなるインフラ整備等が急務となっている。

ティラワ SEZ（約 2,400ha）のうち、早期開発区域（Zone A 区域：約 400ha）については、2013 年から日緬共同事業体（MJTD: Myanmar Japan Thilawa Development Ltd.）により先行して開発が進められている。2014 年 3 月には当機構海外投融資による出資が決定され、2015 年 9 月に開業した。

一方、残りの約 2,000ha については、現状必要な調査が行われておらず、ミャンマー政府から JICA に対し調査の要請がなされた。本調査は、同要請等を踏まえ、民間企業の事業性判断に資する資料を作成するための調査を行うものである。

1.2 調査の目的

本調査は、Zone A 区域以外の約 2,000ha 区域の事業サイトのポテンシャル分析、土地利用計画の策定等を行うことにより、同区域への投資に係る事業性の判断に資する資料を作成する。

1.3 調査対象地域

ミャンマー国ヤンゴン市近郊のティラワ SEZ 合計約 2,400ha の Zone A 区域（約 400ha）を除く約 2,000ha 区域を対象とする。

2 調査内容・方法

2.1 基本方針

本業務の実施にあたっては、以下の基本方針に従うものとする。

①事業性の検討に係る基本方針
②環境社会配慮に関する業務に係る基本方針
③本業務の進め方に関する基本方針

①事業性の検討に係る基本方針

基本方針 ①－１	本件調査の最終的なアウトプットを、2,000haに関わる開発基本計画の策定と位置づけ、そのために必要な調査・分析を実施する。 ・本件調査は、ティラワ SEZ における産業・商業・公共・住宅等の各種土地利用を実現可能な計画に落とし込むことにより、日緬両政府がティラワ事業全体の開発方向性につき合意することを目的とするものである。
基本方針 ①－２	開発基本計画は、マーケット調査による具体的なデータに基づいて策定する。 ・開発基本計画は、日緬政府の意向の反映及び地理的条件を勘案することに加え、計画の実現可能性を向上させるため、特に産業誘致の可能性や具体的な不動産需要調査等、マーケット調査を重視して策定することとする。
基本方針 ①－３	マーケット調査は、できるだけ具体的な不動産市場のデータを参照する。 ・基本方針①－２に関連し、マーケット調査(産業誘致の可能性や具体的な不動産需要調査等)を実施するにあたっては、可能な限り具体的な不動産市場の動向を参照することとする。
基本方針 ①－４	開発基本計画は、類似複合都市開発事例を参照して策定する。 ・世界における大規模な複合都市開発事業に関する情報を収集し、開発基本計画策定にあたり参考にする。

②環境社会配慮に関する業務に係る基本方針

基本方針 ②－１	環境社会配慮を踏まえた事業推進。 ・本事業は、「国際協力機構環境社会配慮ガイドライン」(2010 年 4 月公布)上環境カテゴリ A に分類されるところ、同ガイドラインに基づいた対応を図るため、調査団員の配置やスケジュールの設定にあたっては、これらを十分に配慮したものとする。 ・事業サイトのポテンシャル分析、開発基本計画の策定等にあたっては、環境社会配慮に十分留意するとともに、将来の事業化に向けては、ミャ

	ンマー国内の環境社会配慮関連手続きを確認するとともに、必要な許認可等の取得についても支援を行う。

③本業務の進め方に関する基本方針

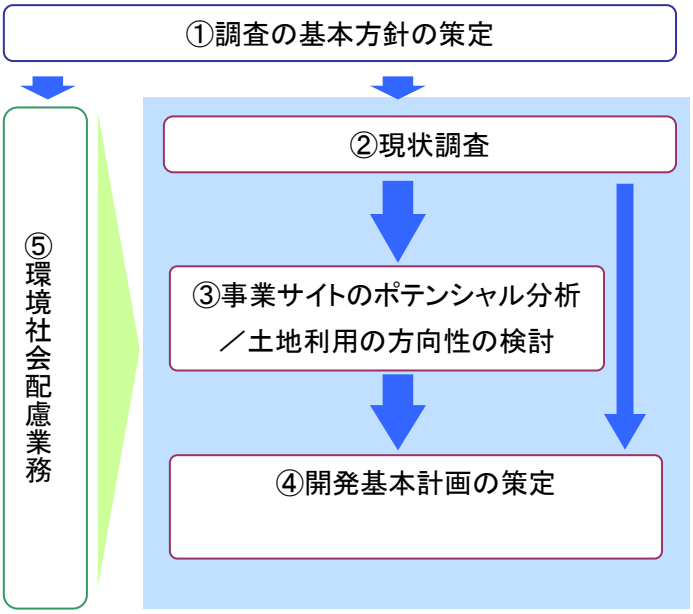
基本方針 ③－１	ミャンマー側関係者に対し、本件調査事業の状況を随時アップデートし、意向を聴取することで、調査結果をミャンマー側関係者の意見・意向を反映したものとする。 ・ティラワ事業は、日本とミャンマーの協働事業であり、ミャンマーにおいては民政移管後の経済発展を国内外に示す象徴的事業である。 ・本事業のこのような重要性を踏まえ、ミャンマー側関係者の意向を汲み取り、随時 JICA と連絡しながら、開発基本計画の策定を実施する。 ・ミャンマー側の関係者としては、日緬調整委員会、国家計画経済開発省、建設省や、商工会議所等を想定する。
基本方針 ③－２	早期開発区域の開発事業者との情報共有、住民移転計画の策定状況に関する情報収集を行う。 ・早期開発区域（400ha）は、2,400ha の中に位置するものであり、2,000ha の開発と相互に大きく関連・影響すると考えられる。本調査にあたっては、民間事業主体を始めとした早期開発区域の関連当事者との連絡を密にし、意見交換を随時実施し、早期開発区域の開発計画、企業誘致の方針等の情報を最大限に入手した上で、開発基本計画を策定する。 ・また、住民移転計画の策定状況に関しても、定期的に確認を行い、開発基本計画等に反映させる。ティラワ SEZ に所在する住民の移転状況は開発のフェージングに関連し、また補償費が開発事業者負担となる場合、事業性に大きく影響することが想定される。
基本方針 ③－３	適切なステークホルダー協議の実施と情報公開。 ・環境社会配慮に関する業務では、スコーピング案と報告書案の段階で、それぞれ情報公開した上で、ステークホルダー分析を踏まえて、現地ステークホルダー協議を行い、協議の結果を調査結果に反映させる必要がある。 ・ステークホルダー協議はこれまでも様々な形で実施されてきたと考えられるため、これまでの経緯を十分に把握しておくことが重要である。
基本方針 ③－４	既往調査、事務所確認作業との重複に留意する。 ・本業務においては、既存の情報を最大限に活用する。このため、JICA 及びミャンマー側関係者から事前に情報共有を受けるとともに、必要に応じて（JICA 側に）経緯の確認等を行う。 ・また、本プロジェクトについては、既に環境社会配慮に関する業務が先行して実施されており、助言委員会でも議論されてきている。これらの

	資料を有効活用するとともに、ベースライン調査等において重複するような調査が行われないように十分配慮する。 ・現在、不足していると考えられる環境データには水質（地下水を含む）や動植物等があると考えられる。メコンデルタは一般に地下水の砒素汚染が問題になることが多いことに留意する。 ・関係法令関係についてもミャンマーでは変化が激しいことから、法整備の動向について適切にフォローすることとする。

2.2 本調査の実施プロセス

本調査の実施プロセスは、以下の通りである。

Task①：調査の基本方針の策定（JICA と確認済み事項の情報共有、インセプション・レポート等）
Task②：現状調査（既往計画や関連調査レビュー、現況確認、ボトルネックの確認等）
Task③：事業サイトのポテンシャル分析／土地利用の方向性の検討（経済状況分析、潜在需要調査、類似事例調査等を踏まえた誘致候補産業検討、土地利用方向性の検討）
Task④：開発基本計画の策定（土地利用基本計画の策定）
Task⑤：環境社会配慮業務（環境・社会状況に係るベースライン調査及び土地利用計画に関する代替案検討）



2.3 実施方法

本調査の実施プロセスに沿って、以下、調査内容・方法を記す。

【Task1】調査の基本方針の策定（JICA と確認済み事項の情報共有、インセプション・レポート等）

JICA 及びその他官公庁の事業において確認済み事項の情報共有を受け、机上での初期段階のレビューを行う。特に、日本政府・ミャンマー政府の方針・合意事項について確認することで調査の方向性をつける。そして、これを踏まえつつ、調査方法、工程、手順等にかかる基本方針（案）を作成し、インセプション・レポート（案）を作成する。

インセプション・レポート（案）は、JICA が開催する検討会における関係機関からのコメントを踏まえ、JICA と協議の上で修正する。そして修正版のインセプション・レポートを JICA に提出するとともに、ミャンマー政府関係機関への説明、内容に関する協議を行い、了解を得る。

【Task2】現状調査（既往計画や関連調査レビュー、現況確認、ボトルネックの確認等）

現状調査として、関連調査、ミャンマー政府の SEZ 開発計画（他の SEZ との関係）、インフラ開発計画のレビューを実施する。特に、当該区画の地理的条件や基礎的なインフラに関わる既存調査内容については、調査の重複を回避するため、詳細に確認を行う。

現地においては、ミャンマー側関係者とのキックオフミーティングを行い、インセプション・レポートの提示・説明を行う。また、ミャンマー側の事業推進体制に関する確認を行う。また、Task 1 及び 2 においてレビューした事項を踏まえ、ティラワ事業の現況及びボトルネックの確認を現地で行う。

このほか、Task3 以降の業務に関連し、ヒアリングが必要と考えられるミャンマー政府・関連省庁等との面談・一部調査を開始する。

【Task3】事業サイトのポテンシャル分析／土地利用の方向性の検討（経済状況分析、潜在需要調査、類似事例調査等を踏まえた誘致候補産業検討、土地利用方向性の検討）

ここでは、マーケット・需要サイドの視点に基づき、様々な角度から事業サイトのポテンシャル分析を行い、それを踏まえて土地利用の方向性を検討していく。

具体的な作業ステップは以下の通りである。

①地理的特徴、経済状況、人口動態等を踏まえたティラワ SEZ の産業誘致可能性に関する調査

世界貿易におけるティラワ SEZ・ミャンマーの港湾等のアクセス性、ミャンマーの経済・産業構造、産業発展段階の視点に基づく成長シナリオ、人口動態に基づく労働力供給・消費市場の潜在性等を調査する。そして、この調査結果に基づき、ティラワ SEZ の産業発展に関わるロードマップを策定し、経済成長、産業誘致の牽引役となる事項（有望・重点産業、エネルギー資源、必要となるインフラ、産業振興のための優遇政策等）を整理・分析する。

また、策定した内容について、業界団体等に対してヒアリングを行い、実際の産業・企業の動向とのすり合わせを実施する。

項　目	内　容
立地分析	ティラワ SEZ 自体の位置・地形的特徴の調査を行う。周辺地区の開発状況やミャンマー国内市場および輸出市場へのアクセス利便性、ティラワ SEZ の港への近接性、後背地の開発可能性などを確認し、産業誘致可能性を調査する。
経済状況分析（ミャンマー）	ミャンマーGDP（産業別・需要項目別動向、寄与度）、貿易（輸出入品目）、海外からの直接投資に関わる統計により、マクロ経済情報の整理を行い、ミャンマーの経済成長において牽引役となる要素の検証を行う。
経済状況分析（ヤンゴン地区）	ヤンゴン地区に関わるマクロ経済分析を行い、ヤンゴン地区の経済成長および整備が必要となるインフラに関わるシナリオを作成する。
産業発展段階分析	ASEAN 内の複数国における過去の経済成長シナリオを産業発展段階の観点で分析し、ミャンマーの経済成長シナリオへの示唆を導き出す。
人口動態分析	ヤンゴン及びティラワ地区を中心に、人口動態に関する調査・将来予測を行い、労働力供給・消費市場としての潜在性を分析する。

②類似事例の調査

ミャンマー国内及び ASEAN 諸国や中国などミャンマー国外における経済特別区において、産業誘致のために採用されている施策および集積している産業等について調査することにより、ティラワ事業において取りうる最適の産業誘致戦略を検討する。

類似事例の調査では、複合型工業団地事業における以下の項目に着目し、整理・分析する。

類似事例調査における整理・分析項目
・コンセプト及び立地 ・特区構成、産業構成、土地利用の用途構成及び施設

③誘致ターゲット産業の選定

ここでは、まず、グローバルなトレンド等を踏まえつつ誘致のターゲットとなる産業の絞込みを図る。その上で、ティラワ SEZ におけるターゲット産業の成長性を精査する。

具体的には、まず、主要な産業に関するグローバルレベルでの生産量や成長性の動向、貿易・FDI を呼び込む可能性について各種統計（UNIDO Industrial Demand-Supply Balance Database、OCC Consulting FDI Database、ミャンマー政府統計ほか）を用いて検討を行い、有望な産業分野を整理する。そして、ミャンマーの経済・産業構造やティラワ及びその周辺地域の産業動向を踏まえつつ 15～20 の産業分野をリスト化し、各産業間での連関も視野に入れて誘致ターゲットとなる産業ミックスを検討する。

次に、ティラワ SEZ に誘致を図る個別産業ごとの成長性や可能性のある製品カテゴリ、各種優遇措置といった詳細を整理するとともに、同 SEZ に立地することの効果・メリット（産業間シナジー効果、サポート産業、原料の調達可能性、港湾アクセス、従業員の雇用等）、将来性、バリューチェーン等を分析する。その際、分析を補強する観点から、個別産業のサブセグメントレベルで複数の企業にヒアリングを行う。

④土地利用方向性の検討

①～③の検討結果等に基づき、想定される産業ミックスにおいて必要となる工業用地の面積を算出するとともに、その結果に基づき雇用者数・人口の予測を行う。そして、これを踏まえ、商業用地、住宅用地等の需要・供給量を検討し、最適な土地利用区分に関する検討を行う。

土地利用の方向性の検討においては複数の代替案の検討を行い、事業性、経済効果、環境社会配慮等の見地から総合的に勘案し、事業関係者が最良の案を選択できるよう検討材料を整理する。

【Task4】開発基本計画の策定（土地利用基本計画の策定）

ここでは、Task1～3 の作業等を踏まえつつ、開発基本計画の検討・作成を進める。

①サイト分析

開発コンセプト、開発目標・指標設定、土地区分案を検討するため、まず、ティラワ SEZ の現地調査・情報収集により、当該区画の地理的分析、現状の土地利用状況及び特徴（植生、担保権等の設定状況）、基本的な所要インフラ（ユーティリティ・交通）に関する分析を行い、当該区画の優位性及び地形等による制限を検討する。また、インフラ開発に関する検討を行うため、ティラワ SEZ に関するインフラ状況の確認を行う。なお、効率的な調査・分析を行うため、Task1～2 で確認する既往情報及び Task3 の調査内容に留意する。

②開発基本計画の検討・策定

Task3（事業サイトのポテンシャル分析／土地利用の方向性の検討）での調査結果を前提とし、JICA 及びミャンマー側関係者の意向を踏まえつつ、開発基本計画を策定する。

まず、ドラフトを最大3案作成し、開発コンセプト、開発目標及び指標の策定、区画の分割及びフェージングに関する具体例を提示し、JICA及びミャンマー側関係者のレビュー・意向の確認を行う。区画割においては、基礎インフラの効率利用及び環境にも配慮した検討を行う。

【Task5】環境社会配慮業務（環境・社会状況に係るベースライン調査及び土地利用計画に関する代替案検討）

①戦略的環境アセスメント

プロジェクトの初期段階において、ミャンマー国の各種政策、JICAの環境社会配慮ガイドラインの趣旨を踏まえて、開発の方針の中に環境社会面の方針を含めるようにし、環境社会面に配慮した計画となるように配慮する。このような開発の方針は、環境社会面のベースライン調査の結果を踏まえ、必要に応じて見直すこととする。ベースライン調査は、既存の調査結果や追加の調査（現地での関係者へのヒアリング、ステークホルダーへのヒアリング等）により実施していく。ベースラインデータの取得にあたっては、既に実施された調査結果を最大限活用するとともに、季節（雨季・乾季等）変動を考慮する。

土地利用の方向性検討段階においては、土地利用計画の代替案を検討する。この代替案の検討段階において、戦略的環境アセスメントの考え方を適用し、事業性、経済効果、交通、施工、環境、社会等の面から代替案の比較・検討を行う。これらの検討結果は、現地で公開するとともに、早期段階の意見を求めるように配慮する。

②環境影響評価制度や環境関連法について最新の情報を収集し、必要な許認可取得の支援を実施

事業の円滑な実施のためには、環境影響評価その他の許認可取得を適切なタイミングで実施することが重要である。ミャンマーにおける法令のうち、外国投資法及び施行規則（Notification No. 11/2013）では、環境影響評価（EIA）と社会影響評価（SIA）について記載されている。また、施行規則（Notification No. 1/2013）には環境影響評価を要する事業種が記載されている。

現在、ミャンマーでは環境影響評価に関する政令（EIA Procedures）が草案中である（2013年2月時点)。この草案は、環境保全林業省及び計画経済開発省(Ministry of National Planning and Economic Development）にてアジア開発銀行（Asian Development Bank, ADB）のガイドラインに沿って策定されていると考えられる。ミャンマーのガイドラインが策定されるまでは、JICAガイドラインを踏まえつつ、ADBのガイドラインに沿ったEIAを実施することで対応できると考えられる。

環境保全法は、14章から構成されており、その中でミャンマー政府は環境保護委員会を設け（第3章4条)、その元で同国の環境基本方針や他の環境方針を定めるものとしている（第3章6条)。環境基本方針を実践する各省庁も委員会で定められた環境基本方針に基づき、国或いは地域における環境計画、基準、モニタリングプログラム、EIA/SIAの承認手続き等を策定、実施する役割が定められている（第4章7条)。現状で環境基準の設定は行われていない。ミ

ャンマーの主要な環境関連法令は以下に示すとおりであり、本調査で関連する事項につき整理を行い、EIA 報告書の中に記載する。また、本調査で明らかになった許認可取得につき、整理するとともに、許認可の取得支援を行う。

○ミャンマーの主要な環境関連法令
・外国投資法（2012 年、The foreign investment law）
・森林法（1992 年、Forestry Law）
・野生動植物保護・自然環境保全法（1994 年、Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law）
・公共衛生法（1972 年、Public Health Law）
・工場法（1951 年、Factory Act）
・領海・海洋法（1977 年、Territorial Sea and maritime Zone Law）
・国家環境政策（1994 年、National Environment Policy）
・鉱物法（1994 年、Mines Law）
・淡水漁業法（1991 年、Freshwater Fisheries Law）
・海洋漁業法（1990 年、Marine Fisheries Law）
・養殖業法（1989 年、Law on Aquaculture）
・灌漑法規（1982 年、Irrigation Laws and Regulations）
・水資源・河川保全法（2006 年、The Conservation of Water Resources and Rivers Law）
・環境保全法（2012 年、Environmental Conservation Law）
・環境保全法施行細則（案）（2013 年 2 月現在、大臣承認後国会手続き中、Environmental Conservation Rules）
・環境影響評価に関する政令（案）（草案中、EIA Procedures）

3 現状調査

3.1 関連調査

ミャンマー政府は、経済成長と国民の所得向上を実現する上で、海外直接投資の誘致を重視しており、特にティラワ、ダウェイ、チャオピュー等の経済特別区（以下「SEZ」）開発による外国企業誘致促進を方針として掲げている。

このようななかで、ティラワ SEZ については、下表に記載する調査が実施されているほか、我が国経済産業省が「平成 23 年度インフラ・システム輸出促進調査等事業（ミャンマーにおけるスマート・コミュニティ実施可能性検討調査)」を実施し、2013 年 2 月に同事業の調査報告書（以下、経産省報告書）が取りまとめられた。

表 3.1.1 ティラワ SEZ 関連調査

調査名	対象地域	概要
ティラワ SEZ 実行可能性調査	2,400ha	ティラワ SEZ 全域の概略基本計画
ティラワ SEZ 内クラス A 開発実行可能性調査	420ha	日本連合とミャンマー連合との共同事業体
ティラワ経済特別区関連インフラ整備事業準備調査	2,400ha 及び周辺地域	優先区クラス A 開発のために必要とされるインフラ整備計画の策定
ティラワ港実行可能性調査	ティラワ港	寸法 800mx750m（3 段階整備計画）

（出典）ミャンマー国ティラワ経済特別区関連インフラ整備事業準備調査

経産省報告書では、ミャンマー経済を概観した上で、「基本計画書」として SEZ 開発の意義と背景、ティラワ SEZ の概要、開発効果等が取りまとめられている。そして、「実施可能性検討書」において、人口・インフラ需要予測、分野別インフラ整備計画、事業コストや資金調達、リスク分析が検討されている。ティラワ SEZ の開発コンセプトについて、「国家プロジェクトとして、ティラワ SEZ を単に製造拠点として整備するのではなく、ミャンマー国の先導的なモデル都市としての整備が望ましい」とした上で、開発戦略として以下の点が掲げられた。

本調査は、こうした関連調査を踏まえて実施するものである。

表 3.1.2 経産省報告書におけるティラワ SEZ 開発戦略

1) 経済活動の活性化及び人材開発
2) エコ&スマート技術の導入
3) 効率的なインフラ整備
4) 安心・安全なまちづくり
5) 環境共生まちづくり

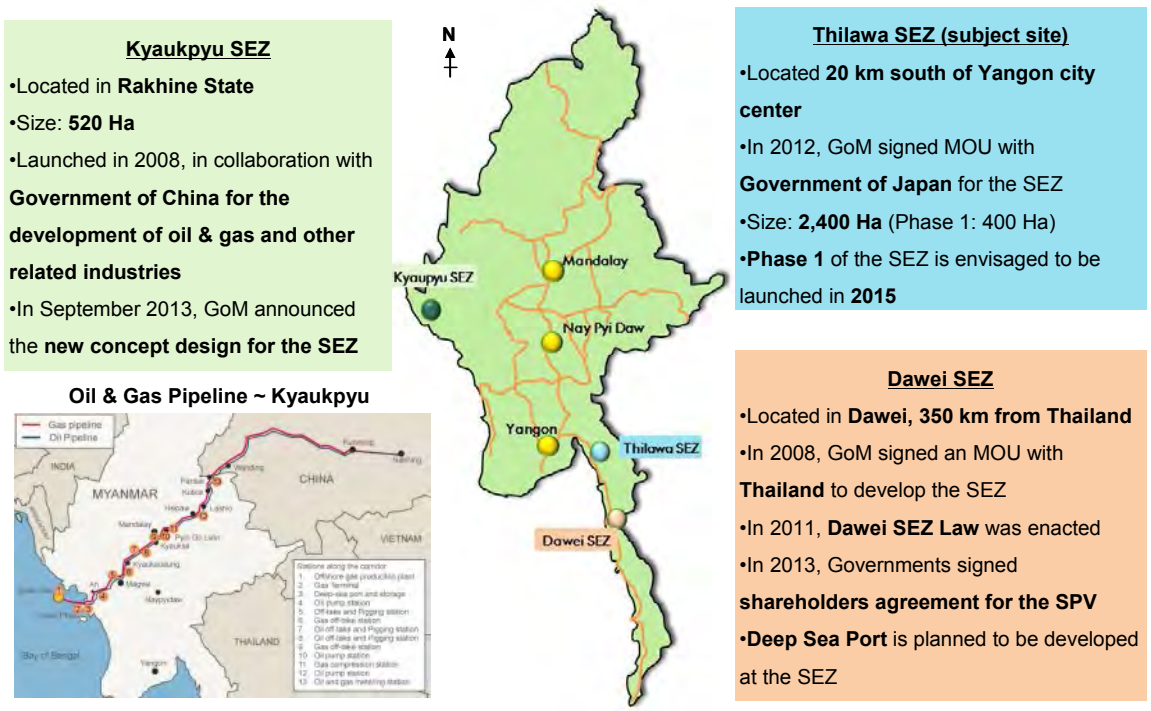
（出典）経産省報告書

3.2 ミャンマー政府の SEZ 開発計画／インフラ開発計画レビュー

（1）ミャンマー政府の SEZ 開発計画

①SEZ 開発計画

ミャンマー政府は、ティラワ SEZ のほか、ダウェー（Dawei）、チャオピュー（Kyaukpyu）での経済特区の整備を進める方針である。



（出典）JICA 調査団

図 3.2.1 ミャンマー政府の主な SEZ 開発計画

②SEZ 関連法整備

ミャンマーでは、経済法制度の整備・改正が進められており、2012 年には、新外国投資法（Foreign Investment Law 2012）が公布され、2013 年 1 月には同法施行細則が発表された。これにより、外資優遇措置のほか、外資進出を禁止する分野や合弁での進出が認められる分野等、これまで認可基準があいまいであった外資参入について、ある程度の方向性が示された。

表 3.2.1 新外国投資法(Foreign Investment Law 2012)の概要

メリット	禁止事項
・民間あるいは政府から長期での土地リース（最長 70 年。50 年+10 年+10 年)。 ・事業開始から 5 年間の免税措置。 ・雑種種子生産や、飲料・酒類、ゴム・プラスチック、国内原料を利用した化学製品などは、ミャンマー国民との共同事業（最大 8 割のシェア）においてのみ製造販売が可能。 ・建設期には輸入した機械設備について、事業運転期の 3 年間は原材料および機械についての免税措置。	・伝統工業・地盤の工業を保護することに焦点を当てている。 ・森林管理保護に関連する製造・サービス、1,000 フィートにおよぶ深度への石油採掘、中小規模の鉱業、鉄くずの製造販売業等。 ・新しい施設・技術を用いない農業や牧畜業。 ・ミャンマーの領海内や河川において、エビや魚などの水産物を対象とする漁業。

（出典）Foreign Investment Law 2012

外国投資家は、外国投資法に加え、経済特区法（Special Economic Zone Law）に基づき投資を行なうことが可能である。同法は、経済特区（SEZ）の設立・運営を通して国内経済の発展を促す観点から制定された。以前に制定されていたミャンマー経済特区法(Special Economic Zone Law）とダウェイ経済特区法（Dawei Special Economic Zone Law）の両 SEZ 法は、2014 年 1 月に新たな経済特区法が制定されて廃止された。

表 3.2.2 新 SEZ 法の概要

	新 SEZ 法概要
法人所得税の免除・減免措置	・免税地域における事業や免税地域への投資事業に関しては、事業開始から 7 年間、法人所得税の免除が認められる。 ・事業促進地域における事業や事業促進地域への投資事業については、事業開始から 5 年間、法人所得税の免除が認められる。 ・免税地域および事業促進地域における事業は、法人所得税免除措置が終了した後、5 年間は法人所得税が半分減免される。 ・事業開始後の法人所得税免除措置および半分減免措置が終了した後は、事業収益を積み立て、積み立て後 1 年以内に再投資した場合に限り、事業収益に係る法人所得税が 5 年間半分減税される。
関税及び原材料に係る諸税の免除措置	・(免税地域の投資家に対して）原材料・機械設備・特定の輸入物品に係る関税や諸税金の免除が認められる。 ・(事業促進地域の投資家に対して）事業開始から建設目的で輸入する機械設備に関しては、関税や諸税の免除が 5 年間認められる。その後 5 年間は、関税や諸税について半分減免が認められる。
欠損金繰越	・欠損金の繰越は 5 年間認められる。
土地利用	・最長 50 年間、その後さらに 25 年間更新という期間設定でのリースでの土地利用が認められる。 ・管理委員会が認める範囲内で、開発者および投資家は、土地や建物を第三者に対して、投資目的で貸すこと、担保とすること、販売することが認められる。

（出典）Special Economic Zone Law

（2）インフラ開発計画

ミャンマーでは現在、政府によるプロジェクトも含め、下記のインフラ開発が検討・実施されている。

インフラ	内　容
①港湾	ミャンマー政府は、ティラワ港を拡張する方針。
②空港	Bago City 近郊に新たな国際空港が建設される予定。既存の空港も拡張。
③道路	「Yangon City Development Concept plan」のもとでヤンゴン地区の道路整備が進められている。
④鉄道	Yangon Circular Railway と Suburban Lines の民営化が検討されている。
⑤電力	天然ガス火力発電所の拡張・新規建設が進行中。

①港湾

ヤンゴンの港湾は、ヤンゴン市内の Yangon Main Port（ヤンゴン川の Elephant point から 32 km）と Thilawa Area Port（ヤンゴン川の Elephant point と Yangon Main Port の中間地点）で構成されている。

ヤンゴン市街に近接する Yangon Main Port には、Asia World Port Terminal（AWPT）、Myanmar Industrial Port（MIP）、Sule Pagoda Wharf（SPW）、Bo Aung Kyaw Wharf（BSW）の 4 つの国際港湾、18 の埠頭がある。

Thilawa Port では、Myanmar International Terminals Thilawa（MITT、Hutchison Port Holdings の子会社）が 5 埠頭、Myanmar Integrated Port Ltd（MIPL）が 1 埠頭を保有する。ミャンマー政府は、ティラワ SEZ 開業による需要拡大を視野に入れ、新たに 5 埠頭を整備し港湾を拡大する方針である。

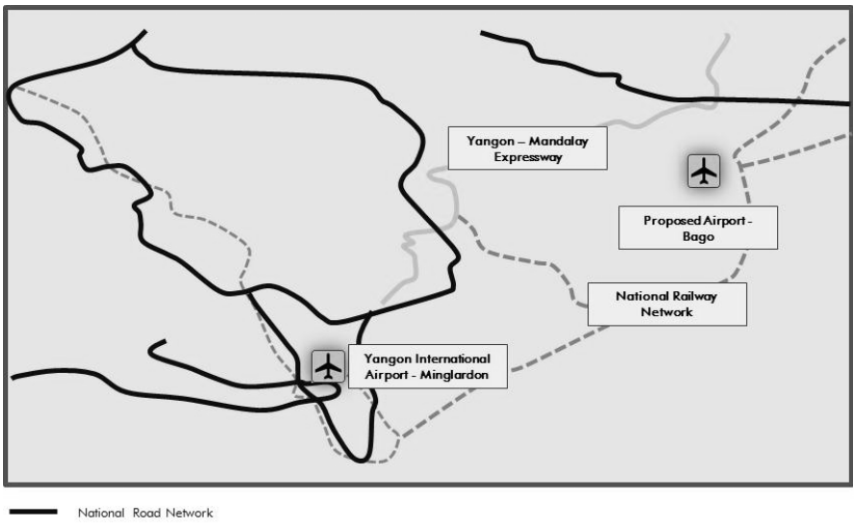
表 3.2.3　ヤンゴン港・ティラワ港の概要

	埠頭所有者	延長（m）	エプロン長（m）	コンテナ容量（CEU）
ヤンゴン港（Yangon Main Port）	AWPT			
	No.1	198	30.5	1,000
	No.2	156	19.5	
	No.3	260	30.5	
	MIP	310	18	300
	BSW			
	No.1-2	137	15	1,000
	No.3	183	30	
	SPW			
	No.1-4	137	12	NA
	No.5-7	160	15	
ティラワ港（Thilawa Port）	MITT	1,000	30	1,500
	MIPL	200	17	NA

（出典）Myanmar Port Authority

②空港

ヤンゴン地区のほぼ中心地に位置する Yangon International Airport（YIA）は、国内線 19 路線、国際線 17 路線が就航している。旅客・貨物需要の拡大が見込まれるなかで、ミャンマー政府は新たな国際空港を Bago region（ヤンゴンから 65 km）に開設する方針である。開業は 2018 年を予定している。

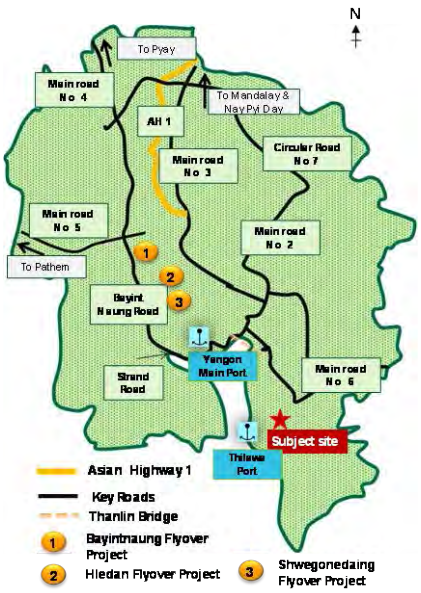


（出典）JICA 調査団

図 3.2.2 ヤンゴン地区・周辺の空港

③道路

ヤンゴンは、Asian Highway 1（AH1）でタイへ、また、5 本の幹線道路でミャンマー国内の他都市と接続している。ヤンゴンから本調査の対象であるティラワ SEZ 地区への主なルートは、①Thanlyin Bridge – Strand Road、②Dagon Bridge – Main Road No. 6 の 2 つがある。



道路インフラに関しては、下表の整備計画があるほか、ヤンゴン市街の渋滞緩和を目的とする高架道路の建設が進められている。

表 3.2.4 交通網整備計画

交通網整備計画	
Yangon City Development Concept Plan	ヤンゴン市外の周辺部分への接続性を改善するため、川にまたがる橋（あるいはトンネル）を建設することが提案されている。
Yangon Structure Plan (Vision 2040)	市街地の渋滞緩和のため内外に環状道路を整備することが提案されている。
Flyover Projects	次の３つの高架道路のプロジェクトが提案されている。 ①Bayintnaung Flyover Project ②Hledan Flyover Project ③Shwegonedaing Flyover Project

（出典）Yangon Master Plan

④鉄道

ヤンゴンの鉄道は、幹線３路線、支線４線を含む８路線があり、Myanmar Railways により運営されている。Yangon Circular Railway と Suburban Lines の 2011 年における平均乗客数は 13 万人／日である。

ミャンマー政府は、BOT（built operate transfer scheme）方式での鉄道インフラの整備を進めている。

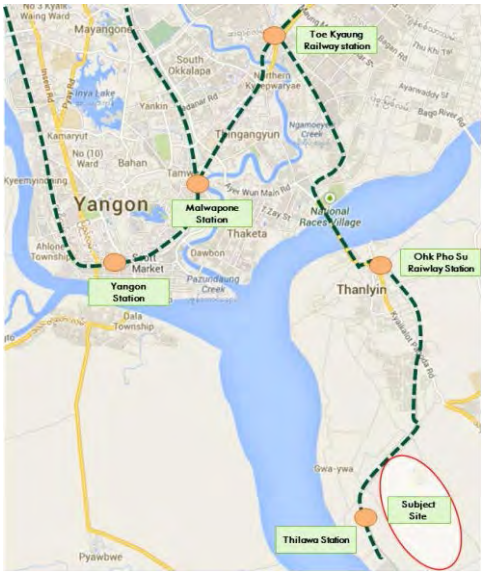


表 3.2.5 主な鉄道インフラ

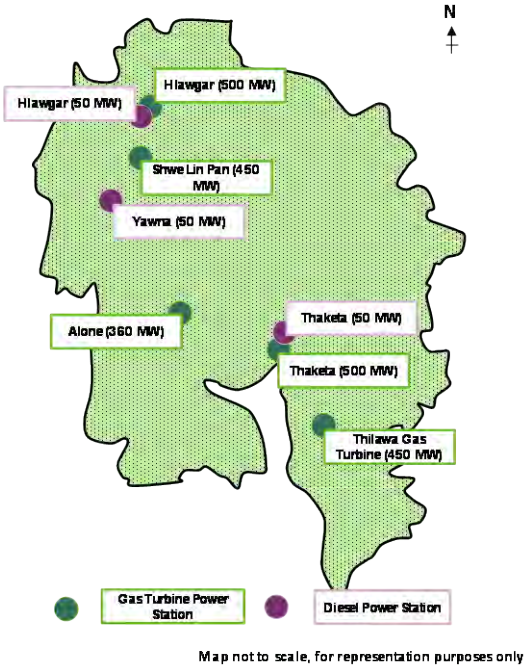
路線名	総延長 (Km)
Yangon Circular Line	47.5
Yangon – Mandalay Line	625 - 650
Yangon – Pyay Main Line	270 - 275
Thilawa Branch Line	26.2

（出典）JICA 調査団

⑤電力

ヤンゴンでは頻繁に停電が発生し、産業・企業活動にとって電力不足は深刻な状況にある。ヤンゴンにおける発電設備導入量は 470.7MW であるが、実際の発電量はその 5 割の 235.5 MW 程度である。ヤンゴン市内では、4 つのコンバインドサイクルガスタービン（CCGT）発電所がヤンゴンにおける電力需要の 31%を発電しているが、ミャンマー全土でみれば、電力の 72%が水力発電によるものであり、これが夏季の水不足等による停電の頻発を招いている。

電力の需給ギャップが生じる主な要因としては、①送配電網における電力ロス、②人口増加と企業活動の活発化による電力需要の拡大、③乾季における水力発電の発電量の低下、④既存の発電所における適切な維持管理の欠如が考えられる。



（出典）Yangon Master Plan

図 3.2.3 ヤンゴンの主な発電所整備計画

Yangon Electricity Supply Board（YESB）によれば、ティラワ SEZ の電力需要を除いても、ヤンゴンの電力需要は今後年 15%拡大していくと見込まれており、電力インフラの適切な整備が不可欠な状況である。

3.3 サイトの現況／ボトルネック確認

（1）対象サイトの概況

ティラワ SEZ の対象サイトは、総面積約 2,400ha で、ヤンゴン市街の南東約 22～25km の距離に位置する。対象サイト周辺での企業活動は Thilawa Industrial Zone や Thanlyin 製油所などに限られており、社会インフラとしての学校、大学、病院なども多くは立地していない。

対象サイトへの距離は、ヤンゴン市街、Yangon Central Railway Station、Yangon Main Port からは 22～25km、Yangon International Airport や Hlaing Thar Yar Industrial Zone、Shwe Pyi Thar Industrial Zone からは概ね 30～45km 圏内である。

約 2,400ha の敷地は平坦な地形となっている。Yangon Main Port と Thilawa Area Port に近接しているほか、既存の Tharkayta、Dagon Seikkan 工業団地といった産業基盤との連結性により発展のシナジー効果が見込まれる。

（出典）JICA 調査団

図 3.3.1　対象サイトの現況

（2）対象サイト周辺の社会インフラ及び企業立地

対象サイトは Thanlyin 区と Kyauktan 区に位置するが、これらの地区では、土地開発が進んでおらず、大半が農地として利用されている。宅地開発も Star City と Aung Chan Thar に限られるほか、商業・小売も地元住民のニーズに対応する小規模なものとなっている。

現時点では、ティラワにおける企業立地も限定的である。Thilawa Industrial Zone は、総面積 175ha の規模であるが、未利用の区画が多い状況である。

表 3.3.1 対象サイト周辺の主な社会インフラ

	種別	概要
Myanmar Maritime University	College	Marine courses ~ 2,250 students
Technological University Thanlyin	College	Engineering courses ~ 10,200 students
University of East Yangon, Thanlyin	College	Arts & Science courses ~ 8,700 students
Horizon International School	School	English medium school for primary, secondary and high school education
Thanlyin	School	Presence of 65 basic education schools
Kyauktan	School	Presence of 110 basic education schools
Thanlyin	Hospital	150 – bedded hospital, 1 station hospital – 16 bed
Kyauktan	Hospital	25 – bedded hospital, 1 station hospital – 16 bed
Thanlyin Club	Golf Course	18-Hole Golf Course
Capital Hypermarket	Retail	Closest prominent retail development in Tharkayta

（出典）Yangon Master Plan

表 3.3.2 Thilawa Industrial Zone

Thilawa Industrial Zone	
総面積	175 Ha
設立年	1998-99
空地率	80-90%
平均区画面積	0.76 Ha
開発会社	DHSHD
産業種別	セメント、衣料、電子機器、物流、鉄骨製作

（出典）JICA 調査団

（3）対象サイトの強みとボトルネック

対象サイトであるティラワ SEZ の強みや機会、留意点をまとめると、下表の通りである。ミャンマー政府が進出企業に各種優遇措置を講じるといった事業環境や豊富な労働力、港湾や鉄道等のインフラの存在、そして 2,400ha 規模の敷地で柔軟な区画設定が可能であること等が強みである。また、ティラワ SEZ は、ミャンマーにおいて高い水準のインフラが整備される最初の SEZ となることで、多くの投資・企業進出を引き寄せる機会が得られると考えられる。

他方、電力インフラが不十分であることや、学校や病院等が少なく、大規模な SEZ に進出・入居する企業、従業員の需要に十分に対応できるかといった懸念等は、留意すべき点である。

表 3.3.3 ティラワ SEZ の主な強み・機会と留意点

項目	内容
強み	<u>ビジネス環境</u> ・**投資支援政策**～ミャンマーの経済特区政策は、潜在的な投資家や製造業者に対して有益なものとなっている。例えば、海外販売収益にかかる法人所得税免除、商業税および付加価値税免除、輸入した原材料や機械・設備にかかる関税免除がある。 <u>労働力</u> ・ティラワ地域における流動性が高く若い労働力が利用できることは、ティラワ SEZ において製造業を設立する上での基盤となる。 <u>戦略的立地</u> ・ティラワ港への近接性は、輸出入産業を支え、物流コスト削減につながる。 ・都市の外縁部に位置することで交通渋滞を回避できる環境にある。 <u>近接する工業団地の存在</u> ・ティラワ SEZ、Bago 川を挟んだ Dagon Seikkan や Tharkayta といった既存の工業団地に近接する。これら工業団地にある産業は、ティラワ SEZ の支援産業として機能する可能性がある。 <u>鉄道</u> ・SEZ 沿いに鉄道線が存在することは、産業発展のための貨物輸送を支える。 <u>大きな土地区画</u> ・ティラワ SEZ は約 2,400 ヘクタールにおよぶ大きな土地区画となっているため、住宅や社会インフラ、物流などの支援機能の配置を柔軟に計画することが可能である。
機会	<u>インフライニシアチブ</u> ・提案されているティラワ地区の大水深港と Bago 近郊の Hanthawaddy 空港は、既存の施設よりも大きな輸送力を持つことが期待されている。これにより、物流の効率化、貨物輸送の促進、海外市場へのアクセスが進む。 <u>プロジェクトサイトの立地</u> ・ティラワ SEZ は、ヤンゴン中心市街に近いという戦略的な立地となっており、産業活動上の利点を享受し、国内市場にアクセスしやすい。 <u>先発者利益</u> ・ミャンマーにおいて開発される高い水準のインフラを備える初めての経済特区である。 <u>外国投資家への魅力</u> ・現在、外国投資家はヤンゴン近郊において良質なインフラとサービスが利用できる適度な工業用地を得ることが困難な状況である。
留意点	・**適切な不動産業者が少なく、良質な社会・サポートインフラも限定的**～SEZ の初期の土地販売に影響を及ぼす可能性がある。 ・**遅延発生の可能性**～港湾インフラ整備が遅延すると、企業による SEZ の土地取得を遅らせる可能性がある。 ・**他の工業団地との競合**～都市部の工業団地において未利用の土地があり、ティラワ SEZ の土地評価に影響を及ぼす可能性がある。ただし、ティラワ SEZ では優れたインフラが提供されるため、そうしたリスクは軽減されると考えられる。 ・**都市の外縁部に立地している**～ティラワ SEZ は工業活動に適しており、交通渋滞を回避できる環境という特徴がある。 ・ティラワ SEZ 周辺の社会インフラは限定的であり、SEZ での大規模な開発を支えるに十分でない。 ・ヤンゴンの電力インフラは不十分であり、企業によるティラワ SEZ の土地取得に影響を与えると考えられる。

（出典）JICA 調査団

4 事業サイトのポテンシャル分析／土地利用の方向性の検討

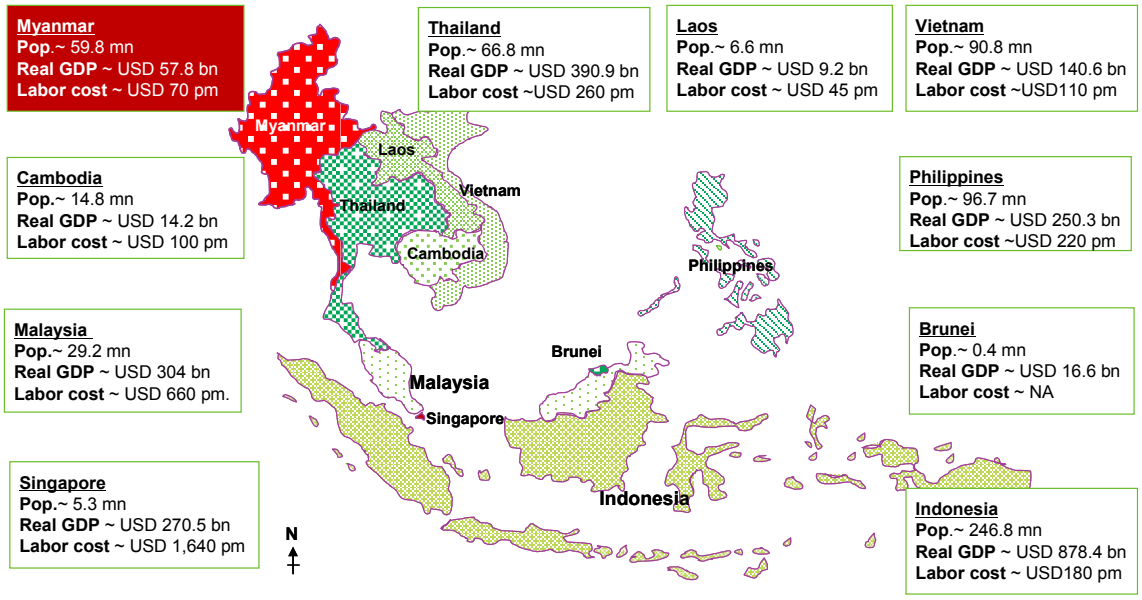
4.1 経済状況分析（マクロ・ミクロ）

（1）ASEAN 経済

①概況

ミャンマーが加盟している ASEAN は、東南アジア 10 カ国で構成され、GDP 約 2.3 兆ドル、世界の人口の約 9%を有する経済圏である。マクロ経済環境の安定性や各種投資政策等により、ASEAN 全体では過去 15 年間で年平均 6%の経済成長を遂げている。

ASEAN は多様な国で構成されている。例えば、シンガポールは ASEAN のなかで最も発展した国であり、2012 年の一人当たり GDP は 52,052 米ドルと、我が国（同 46,732 米ドル）を上回る水準にある。人口や経済の規模では、インドネシアが大国である。また、タイ、マレーシア、ベトナム、インドネシアは成長が著しい新興国であり、我が国製造業のグローバルなサプライチェーンにおいて重要な位置を占めている。

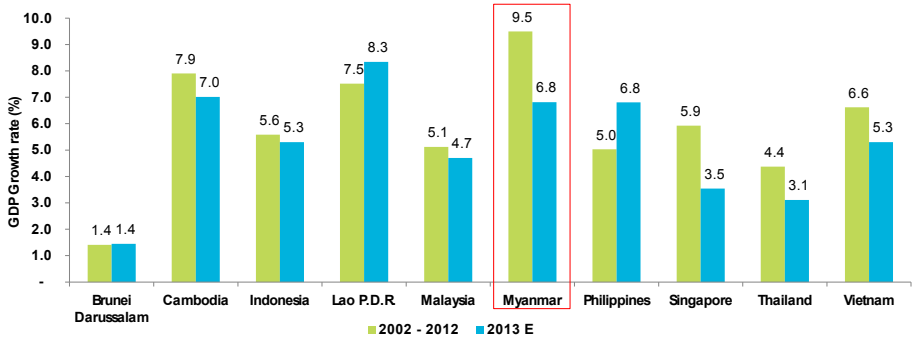


（出典）UNCTAD、MNPED ほか

図 4.1.1 ASEAN 概況

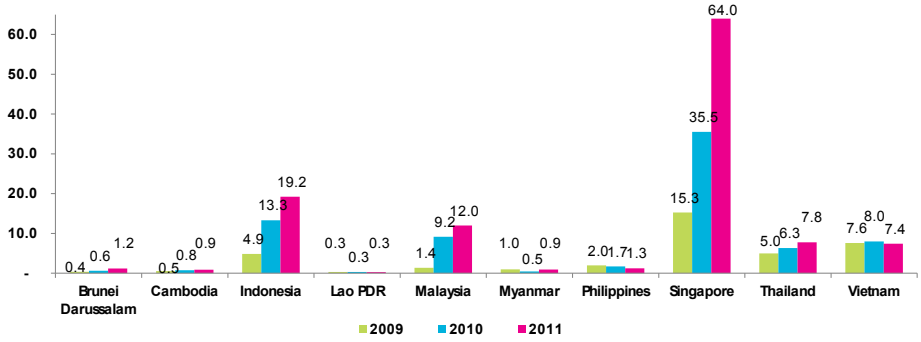
②GDP・貿易・直接投資動向

ASEAN の動向を国別にみると、年率 5%超の経済成長を遂げている国が多い。なかでもミャンマーは、2012 年までの 10 年間、年平均 9.5%の成長を遂げてきた。貿易面では、シンガポール、タイ、ベトナム、マレーシア、インドネシアが ASEAN 内で上位を占めており、また、ASEAN への直接投資（FDI）では、政治面での安定性やビジネス環境の良さ、インフラが整備されていること等を背景に、シンガポールが最大の受入国となっている。



（出典）IMF

図 4.1.2　ASEAN 諸国の経済成長率



（出典）ASEAN Database

図 4.1.3　ASEAN 諸国に対する直接投資

③自由貿易協定等の動向

2015 年には、ASEAN 自由貿易地域（AFTA）による関税撤廃や ASEAN 経済共同体（AEC）の構築が進む予定である。ASEAN 域内の経済統合が進むなかで、域内各国・企業間の競争がより活発化し、ミャンマーにとっては厳しい競争に直面する部分がある一方、ASEAN 域内で構築が進んでいる製造業のグローバルサプライチェーンに組み込まれる可能性が高まり、ミャンマーの経済発展にとって好機となることも考えられる。

表 4.1.1 アジアにおける主な自由貿易協定等

主な計画	概要	ミャンマーへの影響
ASEAN 自由貿易地域（AFTA）	・マレーシア・ブルネイ・インドネシア・フィリピン・シンガポール・タイの 6 か国は、2010 年に関税引き下げ適用品目（Inclusion List：IL）のほぼ全てについて関税を撤廃。 ・2015 年までに ASEAN 原加盟国 6 か国に加え、カンボジア・ラオス・ミャンマー・ベトナム（いわゆる CLMV 諸国）も含め、関税が撤廃される*。	・他の ASEAN 諸国からの輸入品との競争が激化することが見込まれる。 ・諸外国と競争する上で、熟練労働力や電源供給といった産業への投入要素の改善が必要。
ASEAN 経済共同体（AEC）の発足	・2015 年 12 月に発足する予定の ASEAN 経済共同体は、①統合された市場・生産拠点、②競争力のある経済地域、③公平な経済発展、④グローバル経済への統合を目指すものである。	・低コストの国々に進出・移転しようとする企業の活動を背景に、ミャンマーが主要なグローバルサプライチェーンに組み込まれることが期待される。
その他地域との協定	・中国・日本・韓国・インド・オーストラリアおよびニュージーランドとの間で自由貿易協定が調印されている。	・これら諸国への輸出が容易になる一方、これら諸国からの輸入が増加する可能性もある。

（注）CLMV 諸国については、IL 掲載の品目の約 66%について輸入関税を撤廃することとなっている。

（出典）JICA 調査団

（2）ミャンマー経済

①概況

ミャンマーは、人口約 5,141 万人、面積は約 68 万 km2（日本の約 1.8 倍）である。インドシナ半島の西端、東はタイ、ラオス、西はインド、バングラデシュ、北は中国と国境を接し、南はインド洋に面する。東南アジアのなかでも戦略的な位置にある。

2011 年の新政権発足と民政移管の実現、経済特区法の制定やその後の改正、外国投資法の改正による海外からの投資の呼び込みの強化等を背景に、ミャンマー経済への期待が高まっている。

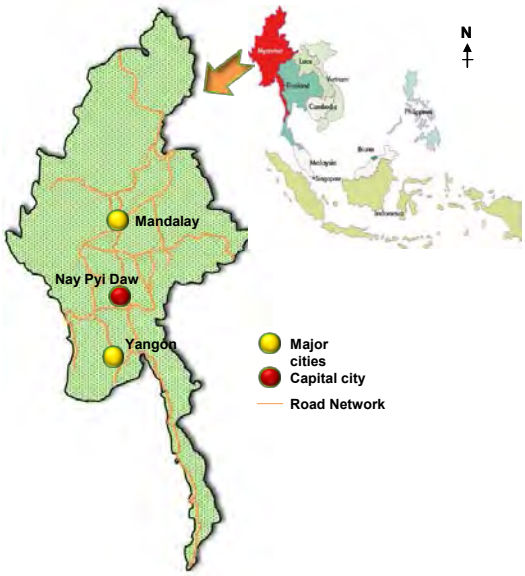
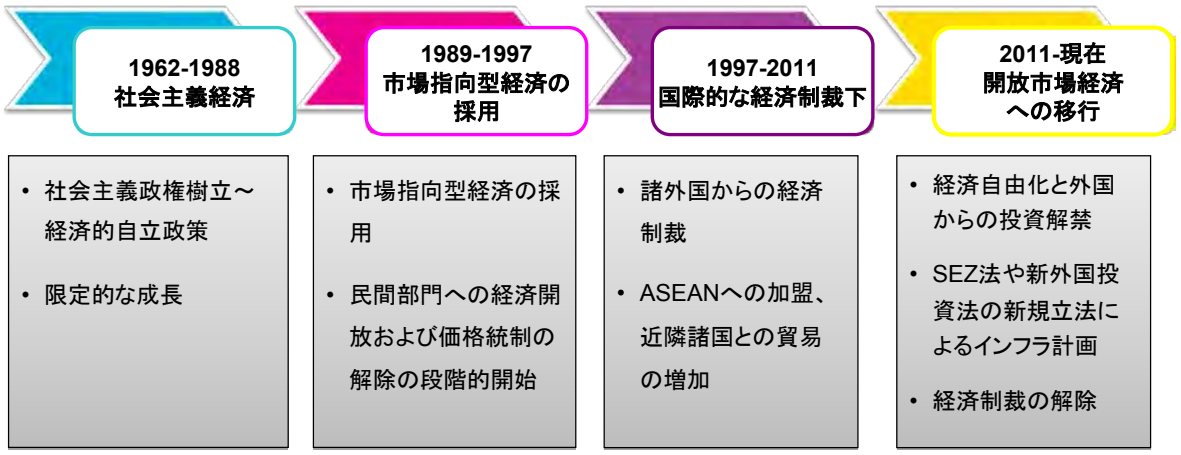


表 4.1.2 ミャンマー概要

Myanmar snapshot	
面積	68 万km²
人口	5,141 万人
成人識字率	95.13%
名目 GDP	553 億米ドル

（出典）日本外務省ほか



（出典）JICA 調査団

図 4.1.4 ミャンマー経済の展開

②GDP・貿易・直接投資動向

ミャンマーの名目 GDP は 39.9 兆チャット（2011 年）である。GDP の産業部門別構成比は、第 1 次産業が 44%、第 2 次産業が 21%、第 3 次産業が 35%となっており、第 1 次産業の構成比が高い。

貿易については、まず、金額ベースでは、輸出入ともに近年は 90 億ドル前後の水準となっている。品目別では、輸出は天然ガス、農産物、木材・木材加工品、縫製品・衣類、輸入は原油、セメント、機械、輸送機器、電気・電子部品などが主な品目である。輸出入を相手国・地域別にみると、輸出入ともに ASEAN が最大の貿易相手となっており、次いで中国・香港、インド、日本となっている。

ミャンマーへの対内直接投資（FDI）は、2013 年で 437 億ドルの規模である。業種別内訳をみると、電力や石油・ガス分野への直接投資が多い。

表 4.1.3 相手国･地域別輸出入の構成比（%）

	輸出	輸入
ASEAN	49	42
中国・香港	25	30
インド	11	3
日本	5	12
韓国	3	4
その他	7	9
合計	100	100

（注）2012-2013 年のデータ
（出典）MNPED

表 4.1.4 業種別対内直接投資（%）

	構成比
電力	44
石油・天然ガス	33
製造業	8
鉱業	6
ホテル・観光業	4
不動産	3
その他	2
合計	100

（注）2013 年時点
（出典）MNPED

③労働力人口・教育

ミャンマーの人口は約 5,000 万人であり、都市部の人口は 1,500 万人である。

人口の年齢別構成比は、0～14 歳が全体の 29%、15～59 歳が同 62%、60 歳以上が同 9%となっている。労働力人口の中核となる 15～59 歳人口は、男女比が 50:50 であり、現在の豊富

な労働力の供給源となっているほか、0～14 歳の構成比が高く、将来の労働力人口が豊富である。

地域別の人口分布は、ヤンゴンが全人口の 12%、マンダレーが同 14%である。

教育水準については、高等教育の卒業者数 13 万 2,500 人のうち、修士号・博士号を取得しているのは 5%である。高等教育の卒業者数を分野別にみると、科学・技術分野で 38%、芸術・文化・言語が 52%、医療が 4%、経済、教育がそれぞれ 3%である。(2013 年値)

④ミャンマー経済の強みと課題

ミャンマー経済の特徴をまとめると、ミャンマー経済は、農林水産業といった第 1 次産業を中心に成長を遂げてきた。アジアのなかで戦略的な位置にあり、経済共同体の設立を進めている ASEAN の加盟国であること、また、近年の経済・外資政策の改善等は、同国の貿易・投資の拡大につながっている。

投資環境の改善やインフラ整備、SEZ の整備を背景に、今後もミャンマー経済は高い成長が期待される。また、低い労働コストや豊富な資源を背景に、低コストでの生産を追及する製造業の進出が期待され、これに伴い同国の製造業輸出が拡大すると見込まれる。

ミャンマー経済の強みと課題は、下表の通りである。

表 4.1.5 ミャンマー経済の強みと課題

強み	課題
・豊富な天然資源 ・低い労働コスト ・ASEAN 加盟国であること ・外資導入に対する政策の改善	・既存のインフラが脆弱 ・高い技能を有する労働力が少ない ・高い不動産関連コスト ・金融システムの整備が不十分

（出典）JICA 調査団

(3) ヤンゴン経済

①経済概況

商業・金融都市ヤンゴンは、面積 598.75km^2、人口約 700 万人の都市である。実質GDPは 1,647.5 億ドル（2010-2011 年）であり、ミャンマーの鉱工業生産の 65%を占めている。

ヤンゴンの GDP を産業部門別にみると、加工・製造業（食料・飲料、繊維、日用品等）が全体の 37%を占め、最大となっている。次いで、商業 (25%)、サービス (24%)、農林水産業 (8%) となっている。金融面では、ヤンゴンには国営銀行は 73 支店、民間銀行は 86 支店を構えており、同国における金融機関が集中して立地している。

ヤンゴン経済・産業の特徴は以下の通りである。

- 食品・飲料、衣料等の製造業が経済を牽引している。
- ヤンゴンの港湾はミャンマーの貿易の重要拠点であり、アジア諸国との貿易におけるハブとして発展する可能性を有している。
- ASEAN で進む貿易自由化等を背景に、貿易の拡大が見込まれる。

・ 豊富な労働力人口、内需・消費者市場、港湾へのアクセス等を背景に、製造業にとってのポテンシャルを有する。

②労働力人口・教育

ヤンゴンの就業者数は約 510 万人であり、1998～2011 年の間、年平均 2.58%拡大している。就業者数の 68%が第 3 次産業である。地区別では、ヤンゴンの人口の約 20%が中心街区（ティラワ SEZ から 20km）に居住している。

教育については、ヤンゴンには 24 の高等教育機関（ヤンゴン工科大学、ヤンゴン大学等）がある。中等教育機関数（252 校）が初等教育機関数（2277 校）に比して少ないため、進学率が低い状況にある。ミャンマー政府は教育システムの改善を進める方針である。

表 4.1.6 ヤンゴン地区別人口

地区	シェア（%）	増加率 (%)
Downtown/CBD	20%	1.8%
Peripheral Areas	8%	NA
New Suburbs	29%	6.93%
Northern Suburbs	14%	2.36%
Older Suburbs	14%	0.94%
Outer Ring	11%	(0.03%)
South of CBD	4%	6.01%

（出典）Yangon Master Plan

4.2 誘致候補産業の検討

（1）産業構造の分析

①ミャンマーにおける製造業の特徴

ミャンマーにおける製造業は、労働集約型の中小規模の製造業者が中心となっている。特徴としては、①農林水産物等の資源加工が多い、②企業規模では中小企業が中心、③インフォーマル企業が存在、④原材料はアジア近隣諸国等からの輸入に依存といった点が挙げられる。

ヤンゴンとマンダレーでミャンマーの鉱工業生産の約 88%を占めている。これら 2 都市の概要は以下の通りである。

表 4.2.1　ヤンゴン・マンダレーの製造業概要

	Mandalay	Yangon
Production Value (2011 –12)	USD 267.71 mn	USD 7.03 bn
Investment Value (2011–12)	USD 91.55 mn	USD 5.83 bn
No. of industries (2012-13)	7,300; Large scale factories – 1,098	6,029; Large scale factories – 2,171
Major Industrial Zones	Mandalay Industrial Zone, Myotha Industrial Park, Meiktila, etc.	Hlaing Thayar, Shwe Pyi Thar, Minglardon, etc.
Prominent manufacturing industries	Construction materials, food & beverages, transport vehicles	Food & beverages, clothing & wearing apparel, construction materials, etc.

（出典）DISI

ミャンマーの製造業を業種別にみると、食品・飲料、衣料が中核となっている。鉱工業生産額のシェアでは、これら 2 分野で全体の約 9 割を占める。建設資材は主にセメント製造が中心であり、また、日用品は石鹸・洗剤、プラスチック、塗料などである。

設備投資額のシェアでは、食品・飲料分野のみで全体の 9 割弱を占める。

表 4.2.2　ミャンマーの産業構造（鉱工業生産・設備投資）

産業	鉱工業生産額シェア 2012-2013	鉱工業生産年平均増加率 2009～2013	設備投資額シェア 2012-2013
Food and Beverages	52.78%	5%	89.03%
Clothing and wearing apparel	39.37%	113%	3.23%
Construction materials	3.01%	39%	2.44%
Personal & Household goods	1.50%	29%	2.11%
Printing and publishing	0.04%	-12%	0.05%
Industrial raw materials	0.66%	-12%	0.50%
Minerals and petroleum products	0.59%	9%	1.41%
Agriculture equipment	0.01%	-25%	0.01%
Machinery and equipment	0.03%	-30%	0.12%
Transport vehicles	1.19%	23%	0.57%
Electrical goods	0.16%	-13%	0.16%
Miscellaneous	0.64%	-18%	0.37%

（出典）DISI

②ヤンゴンにおける製造業の特徴

ヤンゴンにおける鉱工業生産額のシェアをみると、食品・飲料と衣料で全体の 9 割以上を占めている。ミャンマーにおける食料品の需要が高まっていることが、食品・飲料生産の拡大につながっており、また、安価な労働コストを背景に労働集約型産業である衣料品の生産が拡大している。

また、建設資材のシェアは 2.9%に止まっているが、近年のインフラ整備需要の高まりを背景に、前年比 72%と高い伸びとなっている。

なお、輸送用車両の生産額も前年比 153%と高い伸びを示している。

表 4.2.3 ヤンゴンにおける鉱工業生産額のシェア

産業	鉱工業生産額シェア
Food and Beverages	85.71%
Clothing and wearing apparel	7.82%
Construction material	2.90%
Personal & household goods	1.42%
Printing and publishing	0.04%
Industrial raw materials	0.28%
Minerals and petroleum products	0.04%
Machinery and equipment	0.04%
Transport vehicles	0.86%
Electrical goods	0.14%
Miscellaneous	0.73%

（出典）DISI

③ヤンゴンにおける工業団地

ヤンゴンにおける鉱工業生産の多くは工業団地（industrial zone）で行われている。

工業団地の土地は、一次市場（政府による販売）では土地を取得する余地が少なく、二次市場での取得となるが、実際は更地や空倉庫も多い状況である。平均的な土地価格は、1 平方メートルあたり 60～100 ドルの水準である。

多くの工業団地は電力、水道、2 車線道路といった基本的なインフラが備わっている。一部の工業団地では、セキュリティーゲートや街灯、従業員に対する交通サービス、下水等もある。

主な工業団地の概要は以下の通りである。

表 4.2.4　ヤンゴン管区の主要工業団地

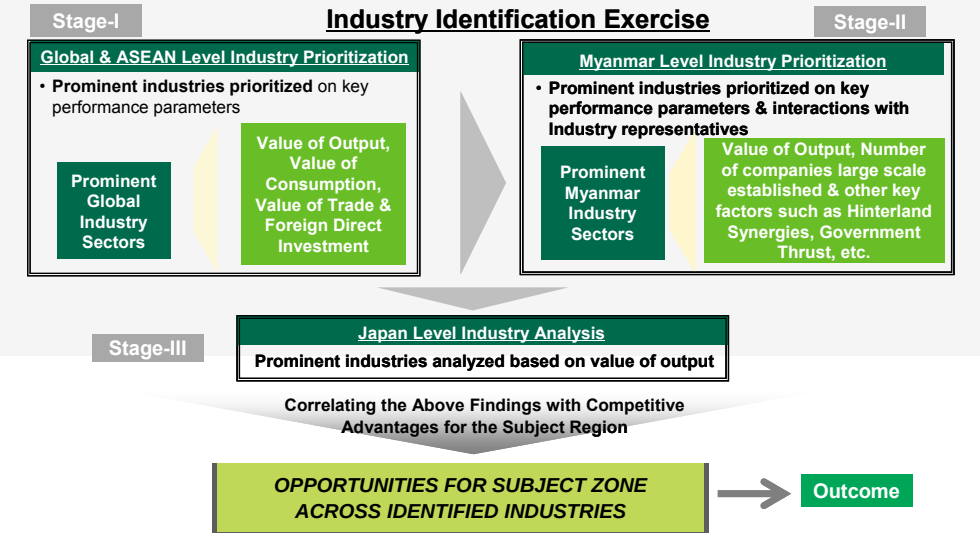
Industrial zone	Gross land area (ha)	App. Current occupancy	No. Of industrial enterprises	Investment value (MMK bn)	Production value (MMK bn)	No. Of workers	Capital value (USD/sqm)
Hlaing Thar Yar (1-7)	657	90%	682	220.45	508.23	39,248	111 – 148
Shwe Pyi Thar (1-4)	536	55%	240	42.06	264.78	19,748	99 – 123
Shwe Lin Pan	445	75%	302	-	-	30,000	49 – 51
Mingaladon	89	100%	20	188	-	8,750	58
Yangon	400	40%	68	32.58	257.18	13,703	87 – 99
East Dagon	317	40%	117	9.31	68.01	3,792	75 – 87
South Dagon	299	80%	831	11.36	114.02	17,316	124 – 185
Dagon Seikkan	490	40%	117	17.51	97.33	6,649	62 – 74
Tharkayta	81	90%	70	7.91	24.01	2,512	NA
Total	3,437	64%	2,447	529	1,334	141,718	-

（出典）DISI

（2）誘致候補産業の検討

①検討のステップ

ティラワ SEZ に誘致する候補となる産業を検討する上では、①グローバル、②ミャンマー・ヤンゴン、③日本の 3 つのレベル（Stage Ⅰ～Ⅲ）において有力な産業を検討し、その結果を踏まえ、誘致候補産業の絞込みを行う。



（出典）JICA 調査団

図 4.2.1　誘致候補産業の検討ステップ

②グローバルレベル

候補産業をグローバルレベルで検討する上では、国際統計を用いて、まず、①鉱工業生産（額・伸び）、消費（額・伸び）、貿易（額）、直接投資（額）の各項目における上位 10 産業を選出し、次に、②各項目にウェイトを設定し総合的な順位付けを行った。その結果は下表の通りである。

表 4.2.5 グローバルレベルでの誘致候補産業の検討

順位	産業分野
1	化学・化学製品
2	基金属
3	機械機器
4	食品・飲料
5	コークス・石油精製品
6	電子部品
7	電気機器
8	自動車・同部品
9	天然ゴム・プラスチック製品
10	その他非金属鉱物製品

（注）UNIDO 2011 database を基に、鉱工業生産額（ウェイト 25%）、鉱工業生産額の伸び（同 5%）、貿易額（同 25%）、FDI（同 20%）、消費額（同 20%）、消費額の伸び（同 5%）から順位を算出。
（出典）JICA 調査団

③ミャンマー・ヤンゴンレベル

ミャンマーにおける有望産業については、政府による各種政策などの定性情報なども踏まえつつ、①鉱工業生産、②企業数、③原料輸出について、各産業のシェアを基に順位付けを行った。企業数や原料輸出は、本調査の対象である SEZ に誘致する産業という観点から、重要な項目であると考えられる。

原料輸出については、木材・木製品は第 5 位であるが、ミャンマーの国土の 49%が森林であること、未加工木材の輸出規制の緩和が検討されていることを踏まえると、今後の発展可能性が見込まれる産業分野であると考えられる。

表 4.2.6 ミャンマー・ヤンゴンレベルでの誘致候補産業の検討

順位	鉱工業生産額	企業数	原料輸出
1	食品・飲料	食品・飲料	天然ガス
2	衣料	化学製品	農林水産物
3	建設資材	建設資材	その他製品
4	化学製品	衣料	繊維
5	輸送機器	鉱物・石油製品	木材・木製品

（出典）DISI

④日本レベル

日本の製造業で生産額が大きい上位の産業分野とミャンマー経済との関連性を整理すると、下表の通りである。基金属はミャンマーでは原料としての利用可能性が限定的であること、天然ゴムはミャンマーにおける生産品の品質が高くないことから、これら 2 分野は、誘致候補産業の検討から除外してもよいと考えられる。

表 4.2.7 日本の製造業の分野別生産額の順位及びミャンマー経済との関連性

順位	産業分野	ミャンマー経済との関連性	検討候補
1	自動車・同部品	ミャンマー国内の多くの自動車が日本から輸入。 日系自動車メーカーがミャンマーでの生産に関心あり。	○
2	電子製品・電気機械機器	ミャンマー政府が電力セクターの強化を掲げている。 ミャンマーの労働コストが低い人員を設備・工場設置に活用可能。	○
3	機械設備	多くの機械設備が日本から輸入されていることに加え、ミャンマー政府のインフラ整備強化策により需要の拡大が見込まれる。	○
4	食品・飲料	日本・ミャンマー両国に共通する主要産業。	○
5	化学・化学製品	日本・ミャンマー両国に共通する主要産業。	○
6	基金属	ミャンマーでは原料としての利用可能性が限定的。	×
7	加工金属製品（機械設備を除く）	機械設備分野の一部として考えることができる。	○
8	天然ゴム・プラスチック製品	天然ゴム農園がヤンゴン近郊にあるが、他の天然ゴム生産国と比較すると製品の質は低い。	×

（出典）JICA 調査団

⑤誘致候補産業

以上の結果を踏まえると、ティラワ SEZ に誘致する候補となると考えられる産業分野は、下表の通りである。

表 4.2.8 日本の製造業の分野別生産額の順位及びミャンマー経済との関連性

順位	産業分野	ミャンマー経済との関連性
1	繊維	ミャンマーの主要産業の一つであり、対内 FDI 規模も大きい。
2	食品・飲料	日本・ミャンマー両国に共通する主要産業。グローバルにみても重要な産業。
3	建設資材	グローバル及びミャンマーにおける重要産業。
4	自動車・同部品	グローバル及び日本における重要産業。 日系自動車メーカーがミャンマーでの生産に関心あり。
5	化学・化学製品	日本・ミャンマー両国に共通する主要産業であり、グローバルにみても主要な産業分野の一つ。
6	木材・木製品	ミャンマーで資源量が豊富であり、将来的な発展が見込まれる。
7	電子・電気	グローバル及び日本における主要産業。ミャンマー政府が電力インフラの改善・強化を掲げている。
8	機械設備	グローバル及び日本における主要産業。ミャンマー政府のインフラ整備強化に向けた投資拡大と天然ガス産業の拡大により需要の増加が見込まれる。

（出典）JICA 調査団

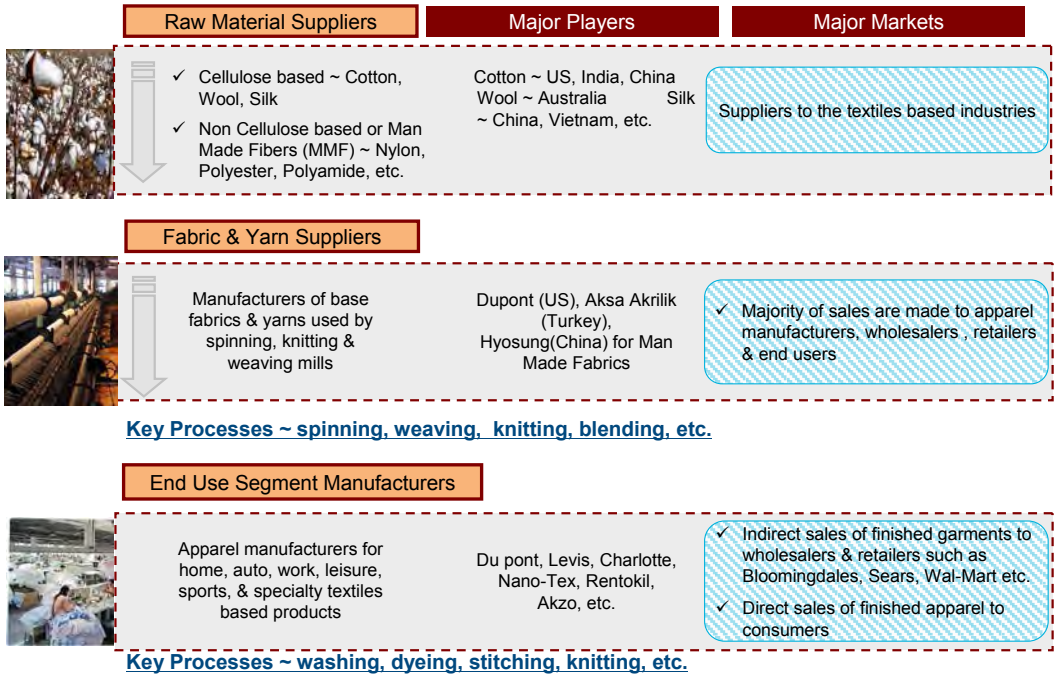
4.3 候補産業の誘致に向けた機会

前節での検討結果を踏まえ、ここでは、①繊維、②食品・飲料、③建設資材、④自動車、⑤化学薬品・製品、⑥木材・木製品、⑦電気・電子、⑧機械設備の分野について、産業誘致の機会を整理・検討する。産業誘致の機会の整理・検討作業においては、関係する政府機関や企業等に対するヒアリングを行い、関係者の見方も整理した。

（1）繊維産業

①概観

繊維産業は、高級繊維製品（綿・ウール・シルク等の天然素材、ハンドメイド品、家具や自動車用の特殊製品等）と一般繊維製品（衣服、コートやスーツ、レジャー服、寝巻き、下着等）、大きく 2 つのサブカテゴリーに分けられる。また、繊維産業の構造は、原料生産、生地・糸生産、最終製品製造の 3 段階に分けられる。



（出典）JICA 調査団

図 4.3.1　繊維産業の構造

②ミャンマーにおける繊維産業

ミャンマーにおける繊維産業は、工業生産額でみると食品・飲料産業に次ぐ第 2 位の産業分野である。労働集約型の産業であり、第二次産業に従事する国内労働力の 45%が繊維産業における就業者である。特に女性に労働機会をもたらしている。貿易面では、輸出額が 2007 年から 2011 年に年平均成長率で 15%も拡大した。日本や韓国に対する衣料品の輸出が著しい伸びをみせているほか、今後は経済制裁を解除した EU への衣料品の輸出の拡大が期待される。

Opal International 社や Great World Wide 社などの大規模工場がヤンゴンに立地しており、繊維・衣料品の国内生産の 91%がヤンゴンで行われている。

③繊維産業の機会

繊維産業のグローバルな動向やアジア諸国、ミャンマーの状況を踏まえると、ティラワ SEZ への企業・工場誘致としては、短期～中期の展望として、輸出を想定した衣料品（アパレル）生産や、履物、布製家具・クッション、スーツ生地等の生産を手がける企業、また、中期から長期の展望として、綿・ウール・シルク製品やハンドメイド品などの高級品を生産する企業が対象となる可能性があると考えられる。

その概要は次の表の通りである。また、企業関係者からも、繊維産業の成長性や機会についてポジティブな見方が示された。

表 4.3.1 繊維産業の誘致に向けた機会

【輸出を想定した衣料品（アパレル）生産】 ○現状：生産活動が盛んであり、ヤンゴンに複数の工場が立地している。 ○展望：短期～中期 ○機会： ・中国・韓国の進出企業が生産を拡大し、ヤンゴンにおける工場を拡張していることから、SEZ のインフラ整備によりこれらの大規模な企業・工場をテナントとして誘致する機会がある。 ・地元の輸出企業は受注を拡大しており、ヤンゴンにおける事業を拡張し始めていることから、SEZ の土地価格や土地購入代金の支払方法の設定によってはこれら企業を誘致することができる。 ・米国と EU による経済制裁の解除により、海外の小売大手が衣料品の調達先としてミャンマーを検討するようになれば、新たな工場の設立が見込まれる。SEZ のすぐれたインフラや優遇措置により、これら企業を誘致することが可能である。
【履物、布製家具・クッション、スーツ生地等の生産】 ○現状：生産活動がある程度行われている。 ○展望：短期～中期 ○機会： ・米国や EU のアパレルバイヤーがキルトやクッションカバー等のより上位の製品をするようになると、この分野の工場も誘致対象となりうる。 ・ミャンマーの革製品は周辺のアジア諸国のものよりも品質が高く、履物や他の革製品の製造工場は誘致対象になると考えられる。
【綿・ウール・シルク製品やハンドメイド品などの高級品生産】 ○現状：生産活動がある程度行われている。 ○展望：中期～長期 ○機会： ・ミャンマーにおける綿生産やアパレル輸出の拡大を背景に、高級糸・生地の生産工場が建設される可能性がある。繊維産業クラスターの形成や SEZ による優遇措置等により、こうした高級品生産の企業・工場を誘致する機会が広がる。

（出典）JICA 調査団

表 4.3.2 企業関係者の見方

主要ファクター	コメント
成長性	・過去 2 年にわたり輸出が拡大しており、受注も年率 20～30%拡大している。 - General Manager, A社 ・2009 年の景気低迷時からの需要の回復は顕著であり、当社の生産工場はフル稼働の状況。将来の事業拡大を視野に 2.8ha の工場を新たに賃借した。 - Factory Manager, B社
課題	・主な課題は電力が安定していないこと、物流施設に制約がある点である。 - Factory Manager, C社 ・中国製と比較して当地の生地、糸、ジッパー、ボタンの品質が低く、中国からの輸入に依存している。－Managing Director D社
主な市場	・主な輸出先は日本、韓国、ドイツ、中国であり、ミャンマー国内市場での販売は限定的である。- General Manager, E社 ・経済制裁の解除により、将来的には米国と EU が大きな輸出先になると見込まれる。- Managing Director, F社
インフラ	・中規模な生産設備であれば必要となる土地は 1.2～2ha 程度である。安定した電力供給、工業用地開発、港湾・空港へのアクセスなどの面で改善が必要である。- General Manager, A社
機会	・米国や EU といった新たな市場が開ける機会がある。これら市場はアジア諸国の市場に比べて大きなマージンを確保できると考えられる。- Managing Director, F社 ・ヤンゴンでの生産拠点の設立について中国と韓国のアパレル企業の関心が高まっている。－Factory Manager, C社 ・シャツやズボンだけでなくタオルやカーテン、クッションカバーなど製品の多様化が進む。- General Manager, A社

（出典）JICA 調査団

（2）食品・飲料

①概観

食品・飲料産業は、加工食品製品（Processed Foods：肉加工・鮮魚加工、野菜・フルーツ加工、菓子等)、 飲料製品（Beverages：飲料水・ソフトドリンク・アルコール飲料等)、乳製品（Dairy Products：ミルク・バター・チーズ等)、その他（Other Food Products）に分けられる。

②ミャンマーにおける食品・飲料産業

食品・飲料産業は、ミャンマーにおける工業生産の 5 割強を占める国内最大の産業分野である。労働集約型の産業であり、第二次産業に従事する国内労働力の 34%が食品・飲料産業の就業者である。高付加価値品の製造は限定的であり、食品は農産物・魚加工品、飲料はアルコール・炭酸飲料、ジュース等の生産が中心となっている。

ミャンマーにおける食品・飲料生産の 9 割強がヤンゴンで行われており、ヤンゴンが食品・飲料産業の加工拠点となっている。人口動態やライフスタイルの変化により、手軽な加工食品や飲料への需要が高まりつつある。

③食品・飲料産業の機会

食品・飲料産業のティラワ SEZ への企業・工場誘致は、短期～中期の展望として加工食品製品や飲料製品などを生産する企業が対象となり、長期的には政府の施策次第で乳製品を製造する企業も対象となる可能性があると考えられる。

その概要は次の表の通りである。企業関係者からは、インフラ面での課題などが指摘されたが、食品・飲料産業への需要についてポジティブな見解が示された。

表 4.3.3 食品･飲料産業の誘致に向けた機会

【加工食品】 ○現状：生産活動が活発化しつつあり、主に原料や簡易加工された状態で輸出されている。 ○展望：短期 ○機会： ・ティラワ SEZ はヤンゴンに近接しており、加工食品を求める消費者の裾野が広い。 ・ティラワ SEZ での生産活動に、ヤンゴンの非熟練・半熟練労働者を活用することができる。 ・包装や倉庫、冷蔵保管設備などを活用しやすい環境にある。
【飲料】 ○現状：生産活動はある程度行われており、製品は国内で消費されている。 ○展望：短期 ○機会： ・SEZ はヤンゴンに近いことから、ボトル入りの飲料水やジュース、ビールやアルコール飲料などを求める消費者の裾野は広い。 ・飲料生産に必要な農作物に恵まれている。 ・飲料関連のグローバル企業がミャンマーへの投資を検討しており、アジアの製造拠点としてミャンマーが発展することが期待されている。
【乳製品】 ○現状：生産活動はある程度行われており、原料は輸入されている。 ○展望：限定的（長期的には可能性あり） ○機会： ・ミャンマーにおける乳製品生産は、原料が限られるという制約がある。 ・現在は国内需要の約４割を輸入によりまかなっているが、長期的には政府の施策により変化することが期待される。

（出典）JICA 調査団

表 4.3.4 企業関係者の見方

主要ファクター	コメント
成長性	・地域における加工食品への関心の高まりにより、ミャンマーにおける食品・飲料産業の成長ポテンシャルは高い。 - Owner, G社
課題	・ミャンマーにおける食品関連産業の品質基準は、海外主要製品と比較して著しく低い。 - CEO, H社 ・頻繁に起こる停電と不安定な水供給は、水産物加工をする上での課題となっており、運転費用がかさむ原因となっている。- CEO, I社
主な市場	・ヤンゴンは都市部の人口が多いうえに所得水準が向上していることから、加工食品の主要マーケットとなっている。さらに、食品・飲料製品への需要は、マレーシアやインド、日本といった国々への輸出によって牽引されている。 - CEO, H社
インフラ	・鉄道インフラが脆弱であり、北部ミャンマーからヤンゴンへの農作物原料の輸送の制約となっている。- MD, J社 ・冷蔵保管設備が不十分である上に割高である。 - Managing Director, K社
機会	・地元住民の嗜好性が、パンなどの小麦由来の食品へと変化している。 - CEO, J社 ・インフラや技術的なノウハウの向上次第ではあるものの、ミャンマーは長い海岸線を活かした海鮮・冷凍食品に機会があると考えられる。 - CEO, H社

（出典）JICA 調査団

（3）建設資材

①概観

建設資材産業は、セメント、セラミック、ガラス等を製品としており、主にインフラセクターの影響を受けて発展してきた産業分野である。エネルギー集約型という特徴を持つ成熟した産業分野であり、中小企業からグローバル企業まで幅広い企業が参画している。

②ミャンマーにおける建設資材産業

建設資材産業は、港湾の拡張等のインフラ開発を背景に急速に拡大しており、工業生産額は2009 年から 2013 年にかけて年平均 39%増となっている。

建設資材のうち、セメントは、需要の急速な拡大に伴い年間 480 万トンの生産不足となっており、不足分は近隣国からの輸入で賄われている。もっとも、セメントの主原料である石灰石等は、国内で相当な埋蔵量があることが確認されていることから、セメント生産の将来的な拡大が見込まれる。また、ガラス産業・ガラス関連産業については、生産技術や熟練工の不足、電力不足等を背景にほとんど生産活動は行われていない。長期的な機会としては、ティラワ川床から原料を採取することが可能であると考えられる。

建設資材産業の事業者の大半が小規模事業者であり、大規模事業者数は全体の 17%に過ぎないが、それらの多くはヤンゴン周辺に立地している。

③建設資材産業の機会

建設資材分野は、ミャンマー国内でインフラ開発が盛んであることから、機会に恵まれた産業分野であるとみることができる。ティラワ SEZ への企業・工場誘致については、ミャンマー国内で石灰やクリンカーといった原料が産出されること、近隣のヤンゴンで不動産開発にともなう需要があることから、短期的にはセメント製品生産を行う企業が対象となると考えられる。一方で、その他の石灰関連製品やガラス製品の生産については、今後の中長期的な発展が待たれることや、インフラが未整備になっていることが建設資材生産上の制約となっていることに留意する必要がある。

建設資材分野の概要は次の表の通りである。企業関係者からも、インフラ面等での課題は指摘されつつも、国内需要に伴う機会が指摘された。

表 4.3.5 建設資材産業の誘致に向けた機会

【セメント製品】 ○現状：生産活動がある程度行われている。 ○展望：短期 ○機会： ・インフラ開発に伴う膨大な国内需要を満たすために、ミャンマー国内で産出される石灰岩などの原材料を最大限活用する機会がある。 ・ティラワ SEZ においては、北部ミャンマーからの石灰やクリンカーを用いてセメントを製造することが考えられる。 ・ヤンゴンにおけるインフラ・不動産開発の増加により、柱・パイプ・梁等のセメント関連製品を生産することが考えられる。
【その他石灰関連製品】 ○現状：わずかに生産活動が行われている。 ○展望：中期 ○機会： ・ミャンマーにおいて生産される原材料を最大限活用する機会がある。 ・ティラワ SEZ において、石灰から農業用石灰や飼料添加物を生産する機会がある。
【ガラス製品】 ○現状：わずかに生産活動が行われている。 ○展望：長期 ○機会： ・ティラワ SEZ は川床が近く、長期的にはガラス製品生産に用いるケイ砂を抽出するポテンシャルがあると考えられる。 ・ティラワ SEZ における食品・飲料産業（ボトル）や自動車産業、建設産業等との相乗効果によって機会が生じることが考えられる。

（出典）JICA 調査団

表 4.3.6 企業関係者の見方

主要ファクター	コメント
成長性	・過去数年の新しい都市クラスターの建設や生産活動の活発化により、セメント製品への国内需要の高い伸びが見られる。－Manager, Ｌ社
課題	・道路や鉄道といった脆弱なインフラが、北部・中央ミャンマーよりヤンゴンへセメントを輸送する上での障害となっている。 - Director, M社
主な市場	・ヤンゴンやマンダレー、ネピドーは、ミャンマーにおける不動産開発の中心地となっており、建設資材の主要なマーケットとなっている。 - Distributor of Ｌ社
インフラ	・電力や輸送等のインフラ問題と合わせて、技術上のノウハウが限られていることが懸念材料である。- Manager, Ｌ社
機会	・建設資材製品の需給のミスマッチがあり、大きな機会が存在する。 -Distributor of Ｌ社

（出典）JICA 調査団

（4）自動車

①概観

自動車産業における生産活動は、川上にはプレス加工・金属加工・塗装等、間には部品組立、川下には自動車組み立てがある。

こうした自動車産業におけるプレーヤーは、Tier1・Tier2 の自動車部品メーカーと、自動車メーカーによる階層構造となっている。小さなパーツやサブモジュールを作成する Tier2 の自動車部品メーカー、Tier2 から供給を受けてモジュール製造を手がける Tier1 の自動車部品メーカー、そしてそれらの部品メーカーから供給された機器から自動車の最終的な組立製造を行う自動車メーカーといった構造である。自動車メーカーや Tier1 の自動車部品メーカーは世界各国に進出するグローバル企業であるが、Tier2 の自動車メーカーは主に現地企業となっている。

②ミャンマーにおける自動車産業

ミャンマー国内市場では、販売台数全体の 82%が二輪・三輪車であり、乗用車は同 13%、商用車は同 4%となっている。乗用車の多くは、二輪・三輪車の利用に制限がかけられているヤンゴンにおいて利用されている。

2011 年に輸入規制が緩和されたことを受けて、中古車の輸入台数が急増しているものの、国内における生産活動は限定的である。製造設備が少ないことから、自動車産業に従事する労働人口は全体の 1.3%に止まっている。政府は直接投資の認可（100%出資）や税制上の優遇、部品の現地調達化の推進等を通じて、自動車の国内生産を進めようとしている。

自動車メーカーにとっては、安価な労働力を活用できること、タイやインド・中国に近い戦略的な立地にあること、また、インフラ開発に伴い商用車への需要が見込まれること、高い GDP 伸び率のもとで可処分所得が増え、自動車普及率の伸びが予想されることなど、生産・販売それぞれにおいて様々な機会に恵まれている産業分野である。

現在のところ、自動車の修理・整備といった自動車関連サービスの多くはヤンゴン・マンダレー地区に集中している。ヤンゴン地区に立地することのメリットとしては、港湾への近接性、自動車保有率が高まると考えられる都市部人口、主要都市間の道路網などが挙げられる。

③自動車産業の機会

自動車産業のグローバルな動向やアジア諸国の状況を踏まえると、低い労働コストや地理的に戦略的拠点として活用ができるといったメリットがある。諸外国の自動車メーカーは組立工場をミャンマーに建設することに関心を示しているとされる。また、ミャンマー国内の状況として、自動車普及率が低い一方で、GDP 伸び率が比較的高いことから、今後自動車への需要が伸びることが考えられる。

その概要は次の表の通りである。企業関係者からは、技術的なノウハウや労働者のスキル、インフラ等が課題であるという指摘があった一方で、低価格の車への需要やヤンゴン・マンダレーが主要マーケットとなるといった見解が示された。また、必要となる工業用地の広さの目安についても回答が得られた。

表 4.3.7 自動車産業の誘致に向けた機会

【乗用車・商用車および二輪・三輪製造】 ○現状：生産活動がある程度行われている。現在は組み立てユニットがある。 ○展望：短期～中期 ○機会： ・自動車に対する需要が蓄積されている。 ・日本とインドの自動車メーカー（日産・タタ）が組み立て工場の建設または建設予定であり、これは他の企業を引き寄せる機会となると考えられる。 ・多くの二輪車が国内で使われている。
【自動車部品製造】 ○現状：生産活動がある程度行われている。現在は政府の工場と若干の民間の工場がある。 ○展望：短期～中期 ○機会： ・ミャンマー政府は、自動車部品をミャンマー国内で生産し、自動車 1 台あたり 35%の現地調達率となることを政策として目指そうとしている。
【プレス加工、金属加工、車体製造等】 ○現状：生産活動がある程度行われている。現在は車体製造業が存在している。 ○展望：短期～中期 ○機会： ・ティラワ SEZ にスズキのような大型の自動車メーカーが進出することは、川上産業の活性化につながると考えられる。

（出典）JICA 調査団

表 4.3.8 企業関係者の見方

主要ファクター	コメント
成長性	・自動車の輸入増加に伴い、自動車部品需要の高まり期待される。 - Country head, N社 ・過去２～３年の間にタイヤ需要が急速に拡大。地元企業は、地元の実情に合わせた製品を開発する能力を持つことで独自の優位性を持っている。 - Director, O社
課題	・製造施設を整備する上では、技術的なノウハウとスキルの不足、脆弱なインフラと地元での原料調達の困難さ等が主な課題となっている。 - Country head, N社
主な市場	・自動車普及率が高く、可処分所得が比較的高いヤンゴンとマンダレーは主要マーケットと考えられる。- Director, P社
インフラ	・組み立て工場は通常、約４～4.8 ヘクタールの土地を利用する。 - Director, P社 ・通常、自動車部品メーカーは約 0.8～1.6 ヘクタール、大企業では 3.2～４ヘクタールの土地を利用する。その他、安定した電力供給と開発された工業用地、港への優先的な接続・近接性が必要とされる。 - Director, O社
機会	・ミャンマーの所得水準は低～中所得となっていることから、低価格車に対する需要が高い。- Director, O社 ・低い労働コストを背景に、自動車産業を発展させる機会はある。しかし、そのためには職業訓練や自動車部品産業の発展が必要となる。 - Country Head, N社

（出典）JICA 調査団

（5）化学薬品・製品

①概観

化学薬品・製品産業の製造品は、基礎化学製品、石油化学製品、肥料及び窒素化合物、その他化学製品に大きく分けることができ、工業および農業の発展を支える産業である。従来は先進国における生産が大半を占めていたが、近年は新興国においても生産が盛んになってきている。特にこの 5～8 年、南アジア・東南アジア地域は需要と供給ともに発展の中心となってきている。なお、ミャンマーにおいては化学薬品・製品産業の工業分類が国際的な分類法と異なっており、複数の産業にまたがっていることに留意する必要がある。

②ミャンマーにおける化学薬品・製品産業

化学薬品・製品産業は発展の初期段階にあり、高付加価値の生産活動はほぼ行われていない。国内生産に必要な原料や需要のある完成品は、主に中国から輸入されているのが現状である。ミャンマー国内で主に生産されているのは、石鹸・洗剤、塗料、肥料等である。

石鹸、洗剤、プラスチック関連製品といった一般消費財の生産額は、近年急速に拡大しており、2009 年から 2013 年にかけての年平均成長率は 23%となった。そのうちヤンゴンが占める割合は約 58%に上っている。石鹸や洗剤は、ヤンゴンで急増する中間所得層に手が届く価格帯の製品となり、消費が拡大し続けている。

塗料については、需要は拡大しているものの、利用可能な原料が限られることから生産額に大きな変化はみられていない。塗料産業は、ヤンゴン中心街区の不動産開発やインフラ整備にともなって成長するとみられるが、中国やタイ等の安価な輸入品との競争にさらされている。

ヤンゴンには国内の大工場の 8 割が所在しており、金額ベースでみれば、塗料生産の約 86%はヤンゴンで行われている。

肥料やその他の工業用の製品については、政府所有の工場がわずかにみられる程度である。ミャンマー国内の農業で使用される肥料の大半は、中国、タイ、ベトナム、インド等から輸入されている。

③化学薬品・製品産業の機会

化学薬品・製品産業のティラワ SEZ への企業・工場誘致については、いずれも短期の展望として、プラスチック製品、肥料・農薬、せっけん・洗剤類、塗料を生産する企業が対象となる可能性があると考えられる。このうち肥料や農薬については、ミャンマーが農業に依存していることから今後伸びる余地があると考えられる。また、プラスチック製品については SEZ 近隣に製油所が立地していることがメリットとなると考えられる。

化学薬品・製品産業の機会の概要は次の通りである。企業関係者からも、今後の成長についてポジティブな見方が示された。

表 4.3.9 化学薬品・製品産業の誘致に向けた機会

【プラスチック製品】 ○現状：中小規模の事業者が存在。原材料は輸入によりまかなわれている。 ○展望：短期 ○機会： ・Tanlyin 製油所が近接していることから、SEZ で化学製品・関連製品の生産が見込まれる。 ・加工食品等の包装用としてプラスチック製品の使用が見込まれる。
【肥料・農薬】 ○現状：限定的な生産活動が行われている。 ○展望：短期 ○機会： ・ミャンマーは GDP の 33%を農業に依存しており、需要が見込まれる。 ・有機肥料は現在利用されておらず、政府の政策により今後伸びることが期待される。 ・農業家向けに政府が肥料の使い方や効果についてのトレーニングプログラムを設けている。
【せっけん・洗剤類】 ○現状：中規模な事業者が存在。主に国内需要を満たしている。 ○展望：短期 ○機会： ・ヤンゴンで中間所得層が増加しており、衛生への関心が高まっているのは機会である。 ・現在は輸入に依存している高価品を現地生産に切り替える機会がある。 ・国際的な日用品メーカーの関心が高まっている。
【塗料】 ○現状：中規模な事業者が存在。主に国内需要を満たしている。 ○展望：短期 ○機会： ・ティラワ SEZ に近接するヤンゴンにおいて、インフラ整備や不動産建設が活発である。 ・アクリル塗料のような新しい高価な生産品が出ることは機会となる。 ・自動車産業や機械設備など他の産業との相乗効果が生じることが考えられる。

（出典）JICA 調査団

表 4.3.10 企業関係者の見方

主要ファクター	コメント
成長性	・建設やインフラ分野で大きな需要が見込まれるため、化学製品の生産を拡大することを考えている。- Promoter, Q社 ・経済の 50%以上を農業セクターに依存しているミャンマーにおいて、肥料産業は非常に大きなポテンシャルを有すると考えられる。 - Managing Director, R社
課題	・電力や物流等の脆弱なインフラとともに、技術上のノウハウの不足が主な課題として指摘できる。- Promoter, Q社 ・肥料の輸入が年々増えてきており、低価格での激しい競争が課題となる。 - Managing Director, R社
主な市場	・ヤンゴンは不動産開発が活発であり、ミャンマーにおける塗料の主要マーケットとなっている。- Managing Director, S社 ・緑が広がる周辺地域は、肥料の主要なマーケットと考えることができる。 - Managing Director, R社
インフラ	・肥料工場は通常 0.8 ヘクタール程度、有機肥料工場は 2.4～3.2 ヘクタール必要となる。- Managing Director, R社
機会	・政府が農業家に対して有機肥料を使うメリットを啓蒙する活動を始めたことから、有機肥料マーケットが発展する機会があると考えられる。 - Managing Director, R社

（出典）JICA 調査団

（6）木材・木製品

①概観

木材・木製品産業は、天然資源に依存する産業であり、森林に恵まれた国々において原料が産出される。その後、半加工・最終加工を経て、最終利用目的に応じてさまざまな形態の製品が生産される。木材・木製品産業の生産活動は、小規模の企業によって担われている。住宅、建設、家具、包装、製紙等の産業から需要が発生する。

②ミャンマーにおける木材・木製品産業

木材・木製品産業は、国土のほぼ半分を覆う森林から産出される原材料を利用することが可能である。主に原木や材木の輸出を目的として、国有企業と各地の中小企業が生産活動を行っている。

現在のところ、付加価値のある製造は限定的である。投資やインフラの整備が不十分であることや、高い輸送費、倉庫不足、古い技術が使用されていることなどが背景にあり、バリューチェーンの上流セグメントにおける製造活動が大半を占めている。ミャンマー政府は、森林破壊の防止や木材・木製品産業分野の振興を念頭におき、材木や丸太といった形態での輸出を禁止することを検討しているとみられる。こうした政策が実現すれば、下流セグメントの成長につながるものと考えられる。

ミャンマー北部において産出された原材料は、道路や水路を経由してヤンゴン・マンダレーへと輸送され加工されている。

③木材・木製品産業の機会

木材・木製品産業に関連する企業・工場誘致としては、建設・工業セクターにおける国内需要向けに工業用木材を生産する企業が考えられる。また、国内の不動産向け需要と合わせて欧州向けの輸出用の家具を生産する企業も考えられる。

木材・木製品産業の機会の概要は次の表の通りである。企業関係者からも、ミャンマー国内およびグローバル（特に欧州）の需要があるというポジティブな見方が示されている。

表 4.3.11 木材･木製品産業の誘致に向けた機会

【工業用木材】 ○現状：中規模な事業者の存在がみられる。 ○展望：短期 ○機会： ・建設・工業セクターの伸びが工業用木材製品への需要を喚起するとみられる。 ・ティラワ SEZ では、電気産業や包装用、建設産業向けに相当な機会があると考えられる。
【家具】 ○現状：限定的な生産活動が行われている。中規模な事業者の存在がみられる。 ○展望：短期 ○機会： ・ヤンゴンにおける不動産開発の増加により、かなりの機会がある。 ・欧州において良質なミャンマー産のチークおよび木材製品への需要があることから、木製のフローリングやタイル等については輸出の機会がある。 ・政府のイニシアチブが家具製品の製造の伸びにつながることが期待される。

（出典）JICA 調査団

表 4.3.12 企業関係者の見方

主要ファクター	コメント
成長性	・世界におけるチーク材への高い需要を背景に、ミャンマーで生産された家具の輸出はかなり伸びる余地がある。- Managing Director, T社
課題	・政策の不透明さや過去の政府による独占が、木材・木製品産業における課題となっている。- CEO, U社 ・熟練労働者不足や頻繁な停電、不十分な工具・道具類は、主な課題としてあげることができる。- Managing Director, V社
主な市場	・木製のフローリングやデッキの主な国際市場は欧州となっている。 - Managing Director, T社 ・ヤンゴンは家具製品の最大の消費者市場となっている。 - Managing Director, T社
インフラ	・工業地帯における停電や不十分な鉄道網といったインフラ問題が懸念材料である。- Managing Director, W社
機会	・チークや丸太に対する輸出制限により、現在利用されていない付加価値がある製品のセグメントにおいて機会が生じているとみられる。 - Managing Director, V社

（出典）JICA 調査団

（7）電気・電子

①概観

電気・電子産業の生産品は、ラジオ・テレビ・通信機器と、電気機器、オフィス・コンピューター機器と大きく３つのカテゴリーに分けられる。産業構造は、川上には研究開発や、ダイオード・プラスチック、メタルシート等の生産、中間にCPU・ハードディスク・液晶モニター・メモリ等の生産、川下にはPC・携帯電話や、交流器・電圧調整器などの製品の生産に分けられる。

②ミャンマーにおける電気・電子産業

電気・電子産業は発展の初期段階にあり、一部の大企業によって車のバッテリーやケーブル、小さなコンピューター部品、変圧器、整流器などが生産されている。電気・電子設備の多くが周辺国から輸入されており、国内での生産活動は国内需要向けが大半を占めている。経済開放以前の生産水準が低かったこともあり、2009年から2012年にかけての生産額の年平均成長率は50%となっている。将来的には、政府が推進している電力インフラの開発により、変圧器やケーブル、整流器への需要が拡大すると考えられるが、工業インフラや技術、熟練労働者が不足していることが課題である。

ICT分野については、政治改革を受けて外国企業の参入が始まり、マイクロソフトやGoogleが参入を果たしている。

③電気・電子産業の機会

ティラワSEZへの企業・工場誘致としては、現在～中期的な展望として、現在でも生産されている変圧器やテスター、配電盤のメーカーが対象となる可能性がある。長期な展望としては、現在行われていない高付加価値製品の生産を行う企業や、技術の蓄積や労働者の熟練化に伴ってハイテク分野製品の生産を行う企業が誘致の対象となると考えられる。

表 4.3.13 電気･電子産業の誘致に向けた機会

【電気機器】 ○現状： ・変圧器組み立てユニットはかなりの数がみられる。 ・輸入に依存しており、高付加価値の生産活動はみられない。 ○展望： ・（変圧器組立について）現在～中期 ・（高付加価値生産について）中期～長期 ○機会： ・（変圧器組立について）組立作業の継続に注力することが求められる。 ・（高付加価値生産について）新しい機会を創出することと、すでにある事業内容を多角化することが重要である。
【電子部品】 ○現状： ・輸入依存度が非常に高く、生産活動はほとんど行われていない。 ・原材料生産がみられず電子部品製造の阻害要因となっている。 ○展望： ・（生産活動について）現在 ・（原材料不足について）長期 ○機会： ・（生産活動について）原材料を輸入し、テスターや配電盤の生産といった基本的な生産活動を行うことで、機会を創出していくことが期待される。 ・（原材料不足について）技術や職業訓練を受けた労働者といった条件が揃った上で、ハイテク分野の生産活動における多角化が進むことが期待される。

（出典）JICA 調査団

表 4.3.14 企業関係者の見方

主要ファクター	コメント
成長性	・最近の通信事業の自由化を受けて、複数の新規参入者がインフラ構築に投資し始めている。こうした動きは、通信用ワイヤーや回路、スイッチ等への需要増につながるとみられる。- Managing Director, Ｘ社 ・電力部門の改善の促進や、不動産建設・工業生産活動の伸びは、変圧器やスイッチといった電気機器への需要の伸びをもたらすと考えられる。 - Chairman, Ｙ社
課題	・工業生産を進める上で、停電、中間管理層や上級技師の確保が課題となっている。さらに、川下産業の企業が限られることから、原料は日本やインドネシア、マレーシア、タイからの輸入に依存していることも指摘できる。 - Chairman, Ｙ社
主な市場	・国内主要市場のヤンゴンやマンダレーで輸入品が扱われている。 - Managing Director, Ｘ社
インフラ	・中規模な電子機器製造会社に必要な土地は約２～３ヘクタールである。 - Secretary General, Ｚ団体
機会	・現状としては原料調達に限界があることから、主な事業機会としては電子機器の組立がある。- Chairman, Ｙ社 ・サムソンが大規模工場を建設するとみられ、240 ヘクタールもの土地を探している。- Secretary General, Ｚ団体

（出典）JICA 調査団

（8）機械設備

①概観

機械設備産業は、特別機械設備と一般機械設備に分けられる。特別機械設備はエンジンやタービン、ベアリング、ギア等、一般機械設備は農業機械、冶金機器、食品加工機器等である。原材料メーカー、組立メーカー、最終産品へと加工するメーカーが存在する。

②ミャンマーにおける機械設備産業

機械設備産業は発展の初期段階にある産業分野で、国内の生産額に占める割合は 0.17%（2009～2011 年の平均）に止まっている。国内生産が限定的であるため、機械設備は主に中国や韓国、日本などアジア各国から輸入されている。工業インフラや必要な技術、熟練労働者の不足が課題となっている。

政府がインフラ開発を後押ししていることから、建設機械への需要増が見込まれる。また、食品・飲料や繊維・衣料、鉱業などの産業が拡大していることから、これらの産業において使用する機械設備類に対する需要が高まると考えられる。

ヤンゴンでは、金属加工を中心とした生産活動が行われていることから、金属加工に関連した機械設備への需要がみられる。国内の生産施設の約 5 割がヤンゴンに所在しており、金属板、ケーシング、パイプ、ナット、ボルト等の製品が生産されている。

③機械設備産業の機会

ティラワ SEZ への企業・工場誘致としては、短期～中期の展望として、国内需要向けに輸入代替として金属製品を生産する企業が考えられる。中期～長期の展望として、特別機械設備や一般機械設備を製造する企業が対象となる可能性がある。

その概要は次の表の通りである。企業関係者からは、政策上の課題や、原材料を輸入に依存しているといった見解が示された。

表 4.3.15 機械設備産業の誘致に向けた機会

【特別機械設備】 ○現状：限定的な生産活動しかみられない。必要な機械機器を輸入している。 ○展望：中期～長期 ○機会： ・食品加工や繊維・衣料等、高い需要がある産業向けの機械設備について輸入の代替品となる可能性がある。 ・政府によるインフラ整備の推進が建設向け機械設備に対する需要を喚起すると期待される。
【一般機械設備】 ○現状：限定的な生産活動しかみられない。必要な機械機器を輸入している。 ○展望：中期～長期 ○機会： ・工業用インフラの整備が、物流を支えるリフトや荷役用の機械などの一般機械設備への需要を喚起することが期待される。 ・今後サプライチェーンの発展にともなって、特別機械設備向けの構成部品への派生需要が期待される。
【金属製品】 ○現状：かなり生産活動がみられるようになっている。 ○展望：短期～中期 ○機会： ・輸入代替として組立生産活動が拡大している。 ・機械産業、建設産業、電気産業等が著しく伸びていくことで、国内生産・供給の機会につながるとみられる。

（出典）JICA 調査団

表 4.3.16 企業関係者の見方

主要ファクター	コメント
成長性	・ティラワ SEZ を代表例として、ヤンゴンで活発化する工業活動により需要増が期待できる。- Director, ＡＡ社
課題	・最近設立された Myaun Da Kar 工業団地は、ヤンゴンの全ての製鉄所を収めることを目的としていた。工業団地へ移転しなかった精錬所の操業許可は更新されないこととなっている。- Managing Director, ＢＢ社 ・高品質の原材料は地元調達できない。現在、鉄鋼は主に韓国や台湾、中国から輸入されている。- Managing Director, ＣＣ社
インフラ	・鉄骨製作工場は約 0.8～1.6 ヘクタールの土地を必要とする。また、ガスや信頼性の高い電力供給も必要である。- Managing Director, ＣＣ社
機会	・鉄鋼製作機械は今のところミャンマーにはなく、今後は機会があると考えられる。 - CEO, ＤＤ社

（出典）JICA 調査団

4.4 事業サイト地への潜在需要調査

前節までの調査結果を踏まえ、ここでは、事業サイト地への潜在需要の検討を行った。以下、潜在需要分析の結果概要や、分析手法も含む検討の詳細を取りまとめる。

（1）分析結果概要

①分析の目的

前節までの検討で誘致の候補となった産業の全て（繊維、食品・飲料、建設資材、自動車、化学薬品・製品、木材・木製品、電気・電子、機械設備）について、ティラワ SEZ においてどの程度の土地需要が生じるかを分析する。また、これら誘致候補産業においてどの程度の雇用が見込まれ、その結果として住居や商業等の施設にどの程度の需要が見込まれるかを分析する。

【潜在需要分析の目的】

- 誘致候補となっている産業分野毎に生じる土地需要の検討
- 産業分野毎の土地需要に応じた土地区画数の検討
- 誘致する産業により生じる SEZ 内の雇用や人口の規模（見込み）の検討
- 住宅、オフィス、商業・小売等の関連不動産の需要と土地配分の検討
- SEZ 開発に必要となるその他要素の確認

②分析結果

潜在需要分析の結果概要は下表の通りである。誘致候補産業 8 業種の土地需要は合計で 1,300ha、物流が 75ha であるほか、住宅が 131ha、商業・小売施設・オフィス・ホテルが 15ha、その他関連施設（病院、学校等）が 16ha となった。

次項以降では、産業とその他の支援施設に分けて、それぞれの分析プロセスと分析結果の詳細を示す。

表 4.4.1 ティラワ SEZ に対する潜在需要分析の結果概要

	Total
Industrial	1,300
Logistics	75
Residential	131
Commercial -Convenience shopping area: 2.25 ha -retail mall: 4 ha -Office space: 5.25 ha -hotel: 3.5 ha	15
Support Segment -Healthcare: 4 ha - Hospitals, nursing home, dispensary, etc. -Education: 8 ha – Primary, Secondary schools, vocational colleges, etc. -Other support: 4 ha - Community Room, Community Hall, Library, Recreational Club, etc.	16

（出典）JICA 調査団

（2）各産業の潜在需要分析

①分析手法・プロセス

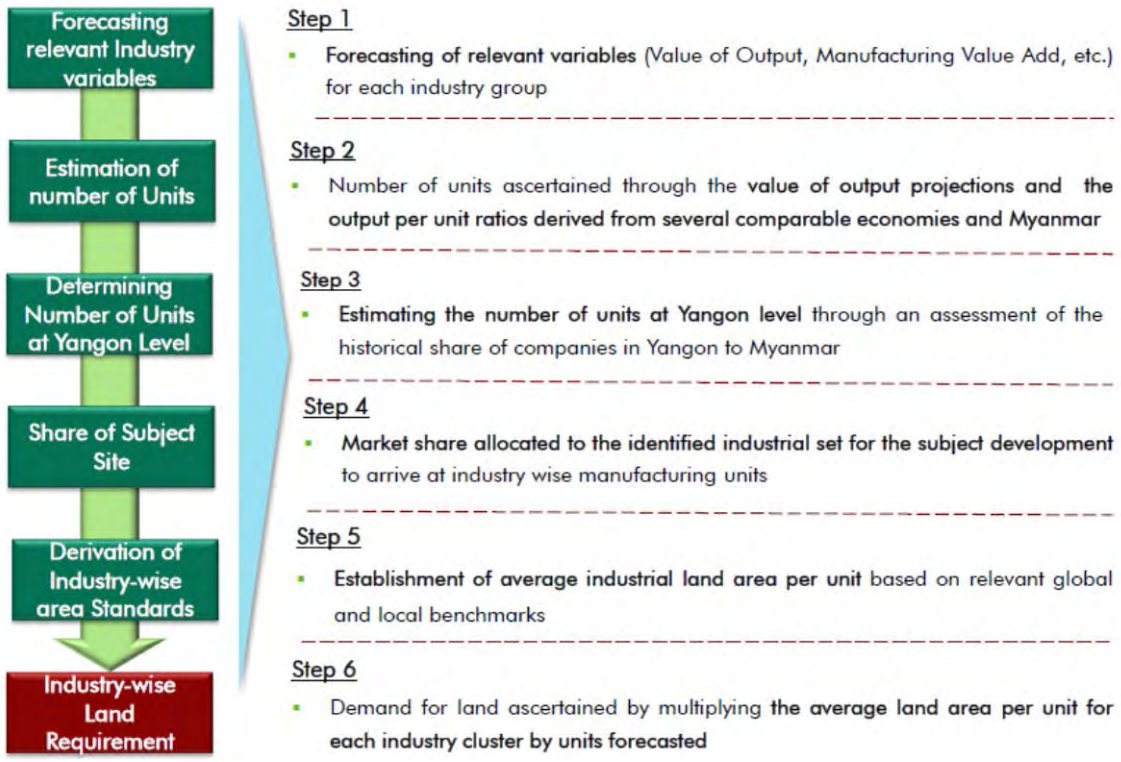
潜在需要を分析する上では、まず、分析の範囲として、2017 年を需要分析の開始年とした。そして、各産業分野の市場動向や成長性を踏まえつつ、需要見通しを検討した。その際、ティラワ SEZ は、国際標準の質の高いサービスを提供し、適切な施設、十分な電力供給、敷地内の道路網、優れた港湾インフラ等へのアクセスを備えていることを前提とした。

分析のプロセスは以下の通りである。

まず、過去の鉱工業生産額の推移を基にしつつ、ミャンマーにおける将来の鉱工業生産額を推計し、生産ユニット当りの生産額を基にミャンマーにおける生産ユニットの動向を算出する。その際、自動車産業など、現在のミャンマーでは発展がみられていない産業については、他のアジア諸国での過去の生産動向・トレンドなどを考慮する。

次に、ヤンゴンの大手企業がミャンマー国内市場に占めるシェアを基に、ヤンゴンレベルでの生産ユニット数の増加分の推移を算出する。そして、ヤンゴン地域における他の工業団地の存在や、企業関係者やミャンマー政府へのヒアリング結果等を考慮しつつ、ティラワ SEZ における生産ユニットの拡大トレンドを検討する。

その上で、ティラワ SEZ における生産ユニットの拡大動向と各産業の生産ユニット当り面積に基づき、産業毎に生じる土地需要（面積）を算出する。生産ユニット当り面積は、ミャンマー国内、ヤンゴン地域、海外の工業団地の事例を踏まえつつ平均値を算出した。



（出典）JICA 調査団

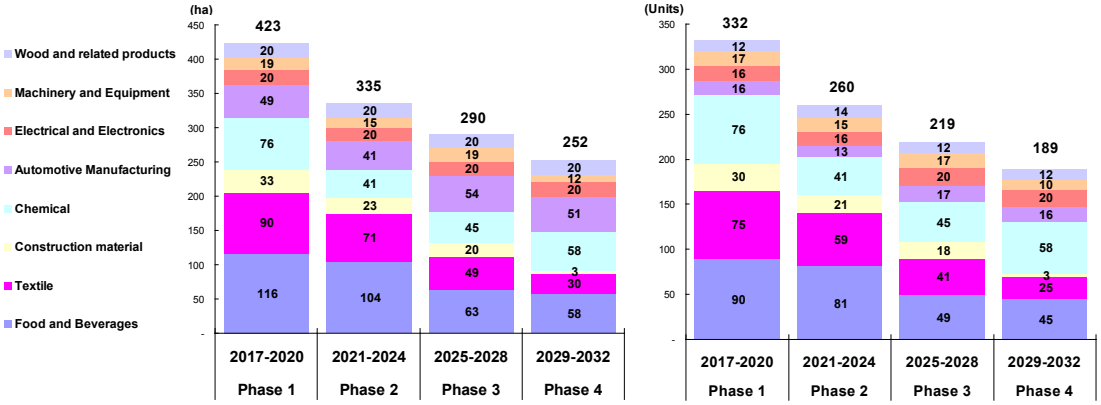
図 4.4.1 潜在需要分析のプロセス

②分析結果

分析結果は以下の通りである。

ティラワ SEZ に対する潜在需要の総面積は 1,300ha であり、これを開発フェーズごとにみると、第 1 フェーズ（2017～2020 年）が 423ha、第 2 フェーズ（2021～2024 年）が 335ha、第 3 フェーズ（2025～2028 年）が 290ha、第 4 フェーズ（2029～2032 年）が 252ha となった。

産業分野別では、2032 年までの合計で、食品・飲料が 341ha、繊維・衣料が 240ha、建設資材が 79ha、化学薬品・製品が 220ha、自動車が 195ha、電気・電子が 94ha、機械設備が 63ha、木材・木製品が 60ha との結果となった。



（出典）JICA 調査団

図 4.4.2 潜在需要分析結果

表 4.4.2 需要推移予測（面積・ユニット数）

【面積（ha）】

	2017	2018	2019	2020	2021	2022	2023	2024
Food and Beverages	30	27	28	31	27	31	23	23
Clothing and wearing apparel	24	22	24	20	22	16	17	17
Construction materials	7	8	9	10	7	3	8	5
Chemical	20	22	16	18	10	12	7	12
Personal goods	14	16	12	13	7	8	3	8
Household goods	3	3	2	3	1	2	2	2
Industrial raw materials	3	3	2	2	2	2	2	2
Automotive Manufacturing	9.5	9.5	15	15	19	9.5	3	9.5
Electrical and Electronics	5	5	5	5	5	5	5	5
Machinery and Equipment (including fabrication)	10.5	2	3	3.5	3	4.5	3	4.5
Wood and Wood related products	5	5	5	5	5	5	5	5
Logistics (approx. 5 - 7% of industrial area)	3.75	3.75	3.75	3.75	5	5	5	5
Total	114	104	109	111	102	91	76	86
Total（Cumulative)	114	218	326	438	540	631	706	793

	2025	2026	2027	2028	2029	2030	2031	2032
Food and Beverages	24	13	13	13	14	14	14	15
Clothing and wearing apparel	25	8	7	8	8	7	7	7
Construction materials	7	7	3	3	3	0	0	0
Chemical	12	13	7	13	14	14	15	15
Personal goods	9	10	4	10	11	11	12	12
Household goods	2	2	2	2	2	2	2	2
Industrial raw materials	1	1	1	1	1	1	1	1
Automotive Manufacturing	9.5	9.5	16	19	13	13	13	12
Electrical and Electronics	5	5	5	5	5	5	5	5
Machinery and Equipment (including fabrication)	5	5.5	6.5	2	3	3	3	3
Wood and Wood related products	5	5	5	5	5	5	5	5
Logistics (approx. 5 - 7% of industrial area)	5	5	5	5	5	5	5	5
Total	98	71	68	74	71	66	67	68
Total（Cumulative)	891	962	1029	1103	1174	1240	1308	1375

【ユニット】

	2017	2018	2019	2020	2021	2022	2023	2024
Food and Beverages	23	21	22	24	21	24	18	18
Clothing and wearing apparel	20	18	20	17	18	13	14	14
Construction materials	6	7	8	9	6	3	7	5
Chemical	20	22	16	18	10	12	7	12
Personal goods	14	16	12	13	7	8	3	8
Household goods	3	3	2	3	1	2	2	2
Industrial raw materials	3	3	2	2	2	2	2	2
Automotive Manufacturing	3	3	5	5	6	3	1	3
Electrical and Electronics	4	4	4	4	4	4	4	4
Machinery and Equipment (including fabrication)	10	2	2	3	3	4	4	4
Wood and Wood related products	3	3	3	3	4	4	3	3
Total	89	80	80	83	72	67	58	63
Total（Cumulative)	89	169	249	332	404	471	529	592

	2025	2026	2027	2028	2029	2030	2031	2032
Food and Beverages	19	10	10	10	11	11	11	12
Clothing and wearing apparel	21	7	6	7	7	6	6	6
Construction materials	6	6	3	3	3	0	0	0
Chemical	12	13	7	13	14	14	15	15
Personal goods	9	10	4	10	11	11	12	12
Household goods	2	2	2	2	2	2	2	2
Industrial raw materials	1	1	1	1	1	1	1	1
Automotive Manufacturing	3	3	5	6	4	4	4	4
Electrical and Electronics	5	5	5	5	5	5	5	5
Machinery and Equipment (including fabrication)	4	5	5	3	2	2	3	3
Wood and Wood related products	3	3	3	3	3	3	3	3
Total	73	52	44	50	49	45	47	48
Total（Cumulative)	665	717	761	811	860	905	952	1000

表 4.4.3 需要推移予測(産業別詳細)

【食品・飲料 (Food and Beverages)】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	9,459	10,594	11,865	13,289	14,617	16,079	17,285	18,582	19,975	20,974	22,023	23,124	24,280	25,494	26,769	28,107
Output Growth Ratio	14%	12%	12%	12%	10%	10%	8%	8%	8%	5%	5%	5%	5%	5%	5%	5%
CAGR (16yrs)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Output per Unit (USDM)	2.90	3.00	3.10	3.21	3.32	3.41	3.49	3.58	3.67	3.76	3.86	3.95	4.05	4.15	4.26	4.36
# of Unit (Myanmar)	3,265	3,533	3,823	4,137	4,397	4,718	4,949	5,190	5,443	5,576	5,712	5,851	5,994	6,140	6,290	6,443
# of Unit (Yangon)	979	1,060	1,147	1,241	1,319	1,416	1,485	1,557	1,633	1,673	1,714	1,755	1,798	1,842	1,887	1,933
# of Unit (Thilawa, theoritical)	245	265	287	310	330	354	371	389	408	418	428	439	450	461	472	483
incre. # of Unit (Thilawa)	23	21	22	24	21	24	18	18	19	10	10	10	11	11	11	12
cumulative # of Unit (Thilawa)	23	44	66	90	111	135	153	171	190	200	210	220	231	242	253	265
Area (ha) pe Unit	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
Thilawa Area (ha)	30	57	85	116	143	174	197	220	245	258	270	283	298	312	326	341

【繊維・衣料 (Textile)】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	2,118	2,382	2,680	3,015	3,392	3,731	4,105	4,515	4,966	5,215	5,476	5,749	6,037	6,339	6,656	6,988
Output Growth Ratio	15%	13%	13%	13%	13%	10%	10%	10%	10%	5%	5%	5%	5%	5%	5%	5%
CAGR (16yrs)	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
Output per Unit (USDM)	1.84	1.89	1.95	2.04	2.15	2.25	2.37	2.49	2.56	2.64	2.72	2.80	2.88	2.97	3.06	3.15
# of Unit (Myanmar)	1,154	1,260	1,376	1,475	1,580	1,655	1,734	1,817	1,940	1,978	2,016	2,055	2,095	2,136	2,177	2,220
# of Unit (Yangon)	865	945	1,032	1,106	1,185	1,241	1,301	1,362	1,455	1,483	1,512	1,541	1,571	1,602	1,633	1,665
# of Unit (Thilawa, theoritical)	199	217	237	254	273	286	299	313	335	341	348	355	361	368	376	383
incre. # of Unit (Thilawa)	20	18	20	17	18	13	14	14	21	7	6	7	7	6	6	6
cumulative # of Unit (Thilawa)	20	38	58	75	93	106	120	134	155	162	168	175	182	188	194	200
Area (ha) pe Unit	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Thilawa Area (ha)	24	46	70	90	112	127	144	161	186	194	202	210	218	226	233	240

【建設資材 (Construction materials)】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	663	796	955	1,146	1,318	1,515	1,743	1,917	2,109	2,320	2,494	2,681	2,882	3,026	3,177	3,336
Output Growth Ratio	20%	20%	20%	20%	15%	15%	15%	10%	10%	10%	8%	8%	8%	5%	5%	5%
CAGR (16yrs)	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%	11%
Output per Unit (USDM)	0.75	0.79	0.83	0.87	0.91	0.96	1.00	1.05	1.11	1.16	1.22	1.28	1.34	1.41	1.48	1.56
# of Unit (Myanmar)	886	1,013	1,157	1,323	1,449	1,587	1,738	1,821	1,907	1,998	2,046	2,094	2,144	2,144	2,144	2,144
# of Unit (Yangon)	266	304	347	397	435	476	521	546	572	599	614	628	643	643	643	643
# of Unit (Thilawa, theoritical)	48	55	62	71	78	86	94	98	103	108	110	113	116	116	116	116
incre. # of Unit (Thilawa)	6	7	8	9	6	3	7	5	6	6	3	3	3	0	0	0
cumulative # of Unit (Thilawa)	6	13	21	30	36	39	46	51	57	63	66	69	72	72	72	72
Area (ha) pe Unit	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Thilawa Area (ha)	7	14	23	33	39	43	50	56	62	69	72	76	79	79	79	79

【化学薬品・製品 (Chemical)】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	481	571	649	739	813	894	984	1,082	1,184	1,296	1,418	1,552	1,699	1,860	2,026	2,209
Output Growth Ratio	*19%*	*19%*	14%	14%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	9%	9%
CAGR (16yrs)	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*	*11%*
Output per Unit (USDM)	*0.33*	*0.34*	*0.36*	*0.38*	*0.40*	*0.41*	*0.44*	*0.46*	*0.48*	*0.50*	*0.53*	*0.56*	*0.58*	*0.61*	*0.64*	*0.68*
# of Unit (Myanmar)	1,583	1,786	1,931	2,088	2,187	2,291	2,401	2,515	2,618	2,725	2,837	2,954	3,077	3,204	3,318	3,437
# of Unit (Yangon)	911	1,041	1,140	1,249	1,308	1,371	1,436	1,504	1,576	1,651	1,729	1,812	1,898	1,988	2,083	2,182
# of Unit (Thilawa, theoritical)	163	185	201	218	229	240	251	263	275	287	299	312	326	341	355	369
incre. # of Unit (Thilawa)	20	22	16	19	9	12	7	12	13	14	8	14	15	15	16	16
cumulative # of Unit (Thilawa)	20	42	58	76	86	98	105	117	129	142	149	162	176	190	205	220
Area (ha) pe Unit	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Thilawa Area (ha)	20	42	58	76	86	98	105	117	129	142	149	162	176	190	205	220

【自動車（Automotive Manufacturing)】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	308	385	482	578	694	833	958	1,101	1,266	1,456	1,675	1,926	2,119	2,330	2,563	2,820
Output Growth Ratio	25%	25%	25%	20%	20%	20%	15%	15%	15%	15%	15%	15%	10%	10%	10%	10%
CAGR (16yrs)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Output per Unit (USDM)	1.29	1.48	1.70	1.96	2.15	2.37	2.60	2.73	2.87	3.01	3.16	3.32	3.49	3.66	3.85	4.04
# of Unit (Myanmar)	240	261	283	296	322	352	368	403	441	483	529	580	607	636	666	698
# of Unit (Yangon)	120	130	150	168	193	204	206	217	229	242	265	290	304	318	333	349
# of Unit (Thilawa, theoritical)	15	33	38	42	48	51	51	54	57	60	66	72	76	80	83	87
incre. # of Unit (Thilawa)	3	3	5	5	6	3	1	3	3	3	5	6	4	4	4	4
cumulative # of Unit (Thilawa)	3	6	11	16	22	25	26	29	32	35	40	46	50	54	58	62
Area (ha) pe Unit	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
Thilawa Area (ha)	9	19	35	50	69	79	82	91	101	110	126	145	157	170	182	195

【電気・電子（Electrical and Electronics)】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	289	361	451	541	636	747	860	989	1,137	1,307	1,503	1,699	1,920	2,150	2,408	2,697
Output Growth Ratio	30%	25%	25%	20%	18%	18%	15%	15%	15%	15%	15%	13%	13%	12%	12%	12%
CAGR (16yrs)	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Output per Unit (USDM)	2.52	2.65	2.78	2.92	3.07	3.22	3.38	3.55	3.73	3.92	4.11	4.32	4.53	4.76	5.00	5.25
# of Unit (Myanmar)	114	136	162	185	207	232	254	278	305	334	366	393	423	452	482	514
# of Unit (Yangon)	98	116	138	157	176	197	216	237	259	284	311	334	360	384	410	437
# of Unit (Thilawa, theoritical)	20	23	28	31	35	39	43	47	52	57	62	67	72	77	82	87
incre. # of Unit (Thilawa)	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5
cumulative # of Unit (Thilawa)	4	8	12	16	20	24	28	32	37	42	47	52	57	62	67	72
Area (ha) pe Unit	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Thilawa Area (ha)	5	10	16	21	26	31	36	42	48	55	61	68	74	81	87	94

【機械設備（Machinery and Equipment (including fabrication))】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	19	24	30	38	47	59	71	85	102	123	147	162	178	196	216	237
Output Growth Ratio		25%	25%	25%	25%	25%	20%	20%	20%	20%	20%	10%	10%	10%	10%	10%
CAGR (16yrs)		17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%	17%
Output per Unit (USDM)	1.00	1.05	1.10	1.16	1.22	1.28	1.34	1.41	1.48	1.55	1.63	1.71	1.80	1.89	1.98	2.08
# of Unit (Myanmar)	19	23	27	33	39	46	53	61	69	79	90	95	99	104	109	114
# of Unit (Yangon)	19	23	27	33	39	46	53	61	69	79	90	95	99	104	109	114
# of Unit (Thilawa, theoritical)	10	12	14	16	19	23	26	30	35	40	45	47	50	52	54	57
incre. # of Unit (Thilawa)	10	2	2	3	3	4	3	4	4	5	6	2	2	2	2	3
cumulative # of Unit (Thilawa)	10	12	14	16	19	23	26	30	35	40	45	47	50	52	54	57
Area (ha) pe Unit	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Thilawa Area (ha)	11	13	15	18	21	26	29	33	38	44	50	52	55	57	60	63

【木材・木製品（Wood and Wood related products)】

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032
Value of Output (USDM)	237	284	341	392	451	519	570	628	690	759	812	869	930	995	1,065	1,140
Output Growth Ratio	20%	20%	20%	15%	15%	15%	10%	10%	10%	10%	7%	7%	7%	7%	7%	7%
CAGR (16yrs)	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Output per Unit (USDM)	0.27	0.29	0.32	0.33	0.35	0.37	0.38	0.40	0.42	0.44	0.45	0.46	0.48	0.49	0.51	0.52
# of Unit (Myanmar)	864	965	1,077	1,180	1,292	1,415	1,483	1,553	1,627	1,738	1,805	1,875	1,948	2,024	2,102	2,184
# of Unit (Yangon)	259	290	323	354	388	425	445	466	488	521	542	563	584	607	631	655
# of Unit (Thilawa, theoritical)	26	29	32	35	39	42	44	47	49	52	54	56	58	61	63	66
incre. # of Unit (Thilawa)	3	3	3	3	4	4	3	3	3	3	3	3	3	3	3	3
cumulative # of Unit (Thilawa)	3	6	9	12	16	20	23	26	29	32	35	38	41	44	47	50
Area (ha) pe Unit	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Thilawa Area (ha)	4	7	11	14	19	24	28	31	35	38	42	46	49	53	56	60

（3）その他支援施設の潜在需要分析

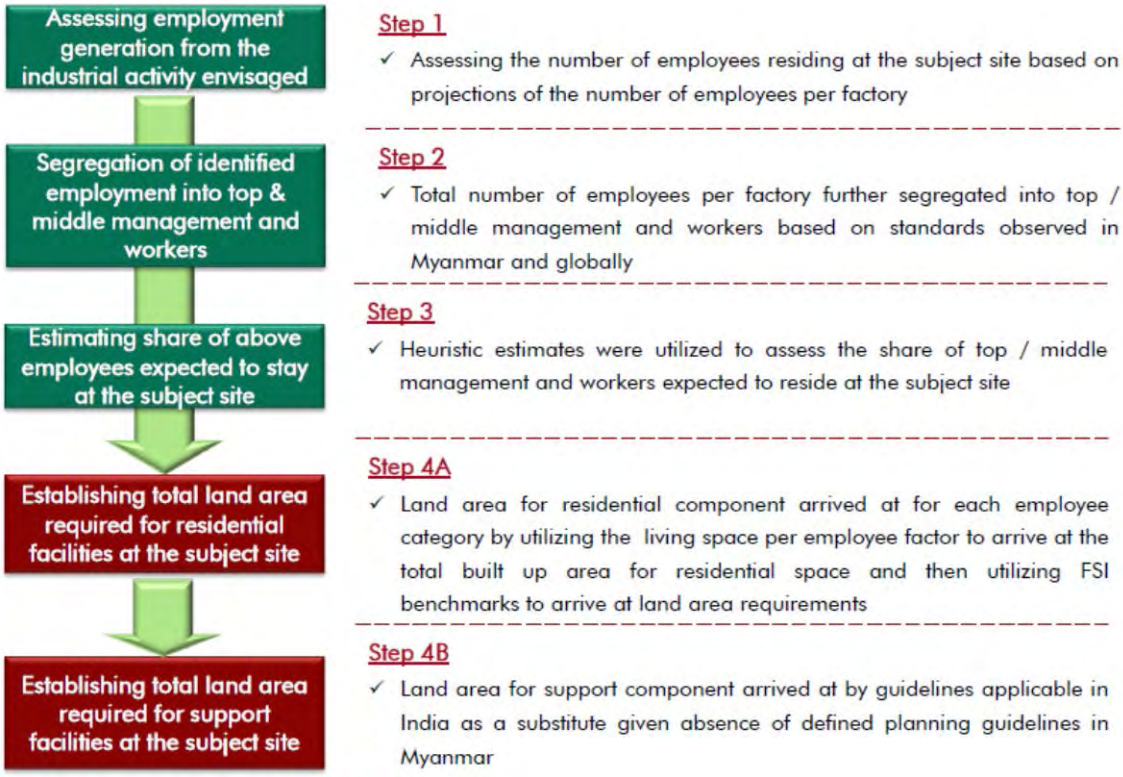
①分析手法・プロセス

分析のプロセスは以下の通りである。

まず、各産業の潜在需要分析で推計された生産ユニット数に対し、生産ユニット当り雇用者数を乗じ、ティラワ SEZ に雇用者総数を算出する。

次に、これを上級管理職（top management）、中間管理職（middle management）、従業員（worker）の職階に区分する。職階区分に当っては、当該産業分野の企業関係者へのヒアリング結果等を踏まえつつ、上級管理職は雇用者数全体の 5%、中間管理職は同 10%、従業員は同 85%とした。そして、各職階がティラワ SEZ 内に居住する割合を設定し、SEZ 内就業人口を算出する。さらに、労働力率を考慮することで、ティラワ SEZ における居住人口を算出する。

ティラワ SEZ 内における住宅は、世帯数を 4 人、職階毎に平均的な居住面積を設定し、需要（面積）を算出した。商業施設や医療・教育施設、社会インフラ等に必要とされる面積は、Indian Urban Development Plan Formulation and Implementations（UDPFI）guidelines を参考にしつつ、ティラワ SEZ 内の居住人口の推定値を基に算出した。



（出典）JICA 調査団

図 4.4.3 その他支援施設の潜在需要分析のプロセス

②分析結果

分析結果は以下の通りである。

2032 年までの累計で、支援施設全体で 161.9ha である。このうち、住宅が 131ha であり、その内訳は上級管理職向け住宅が 25.2ha、中間管理職向けが 49.6ha、従業員向けが 56.2ha となった。また、商業・小売施設やホテルが 15ha、医療・病院等が 4ha、学校等が 8ha、その他コミュニティホール等が 4ha となった。

表 4.4.4 支援施設面積の推移

Net Area (Hectares)	2017	2018	2019	2020	2021	2022	2023	2024
Residential	7.7	7.4	7.7	8.2	8.4	7.7	7.9	7.7
Top Management Housing	1.5	1.4	1.5	1.6	1.6	1.5	1.5	1.5
Middle Management Housing	2.9	2.8	2.9	3.1	3.2	2.9	3.0	2.9
Worker Housing	3.3	3.2	3.3	3.5	3.6	3.3	3.4	3.3
Commercial (including retail malls and hotels)	0.50	0.50	0.50	0.50	1.25	1.25	1.25	1.25
Healthcare	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Education	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Other Support※	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	9.1	8.9	9.2	9.7	10.7	9.9	10.2	10.0
Cumulative	9.1	18.0	27.2	36.9	47.6	57.5	67.7	77.7

Net Area (Hectares)	2025	2026	2027	2028	2029	2030	2031	2032
Residential	8.4	7.9	8.8	8.9	8.7	8.3	8.9	8.4
Top Management Housing	1.6	1.5	1.7	1.7	1.7	1.6	1.7	1.6
Middle Management Housing	3.2	3.0	3.3	3.4	3.3	3.1	3.4	3.2
Worker Housing	3.6	3.4	3.8	3.8	3.7	3.6	3.8	3.6
Commercial (including retail malls and hotels)	0.75	0.75	0.75	0.75	1.25	1.25	1.25	1.25
Healthcare	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Education	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Other Support※	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	10.1	9.7	10.5	10.6	11.0	10.5	11.1	10.7
Cumulative	87.8	97.5	108.0	118.6	129.6	140.1	151.2	161.9

※Other Support: Community Room, Community Hall, Library, Recreational Club, etc.

（出典）JICA 調査団

表 4.4.5 住宅需要の積算概要

Top management housing	Total area: 25 ha No. of units: 902 Average size : 3,000 sft Formats – Villas / Apartments
Middle management housing	Total area: 50 ha No. of units: 3,565 Average size: 1,500 sft Formats - Apartments
Worker housing	Total area: 56 ha No. of units: 15,110 Average size : 400 sft Format – Apartments

Parameters

	Ave. Employee per Unit		# Unit		# Employee
Food and Beverages	112	×	265	=	29,680
Textile	752	×	200	=	150,400
Construction material	58	×	72	=	4,176
Chemical	32	×	220	=	6,946
Automotive Manufacturing	189	×	62	=	11,718
Electrical and Electronics	86	×	72	=	6,192
Machinery and Equipment	43	×	59	=	2,537
Wood and related products	30	×	50	=	1,500
					213,149

	% in Employees		% Reside in SEZ		# Reside in SEZ		Labor Force Participation Rate		SEZ Population
Top Management	5%	×	10%	=	1,074	/	0.3	=	3,585
Middle Management	10%	×	20%	=	4,271	/		=	14,243
General Workers	85%	×	10%	=	18,127	/		=	60,429
					23,472				78,257

	SEZ Population		Household Size		# Units		Ave. space		Total Area (ha)
Top Management	3,585	/	4	=	902	×	3,000sqft *Villa/ Apartment*	=	25
Middle Management	14,243	/		=	3,565	×	1,500sqft *Apartment*	=	50
Workers	60,429	/		=	151	×	400sqft *Apartment*	=	56
									131

5 土地利用の方向性・開発基本計画の検討

5.1 概要

開発基本計画は、ティラワ SEZ における商業・公共・住宅等の各種土地利用を実現可能な計画に落とし込むものである。ティラワ SEZ の最終的な狙いは、グローバルに展開する製造業を誘致し、地域への投資の呼び水となることである。同計画は、あくまで本調査実施時点で入手可能な情報に基づく調査団からの提案であり、事業者による開発を制約するものではない。実際の開発においては、個別の事業者が事業性を検討した上で具体的な開発計画の策定を行うこととなっており、同計画から変更が生じる可能性がある。

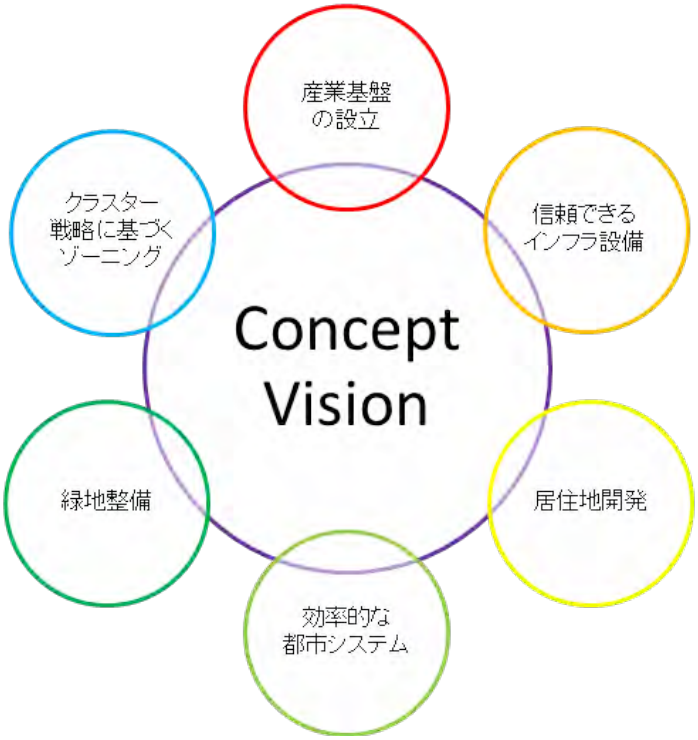
5.2 コンセプト

（1）ティラワ SEZ のコンセプト

開発基本計画を策定するに当たり、ミャンマーにおけるティラワ SEZ の位置づけとしては、地域における新たな産業およびビジネス活動を引き付け、ミャンマーにおける新たな製造拠点となることを想定した。

工業用地は、各種の産業クラスター間でのシナジー効果をもたらされるよう配置され、インフラ面では発電・変電所や貯水池・排水設備等、必要とされるインフラが適切に整備されることを企図した。また、税関や区域外からの SEZ へのアクセスポイント等の設置においては、SEZ 内外を効率的につなぐ道路配置が確保されることを前提とした。

また、ティラワ SEZ の開発コンセプトは、就業、居住、学習、娯楽向けの新たな空間を擁する持続可能な経済特区を構築することである。SEZ 内には居住区が設けられ、効率的な都市システムも導入されることが想定されている。



（出典）JICA 調査団

図 5.2.1　ティラワ SEZ のコンセプト

（2）開発目標・方針

ティラワ SEZ の開発基本計画の提案に際し、念頭に置いた目標・方針は以下の通りである。

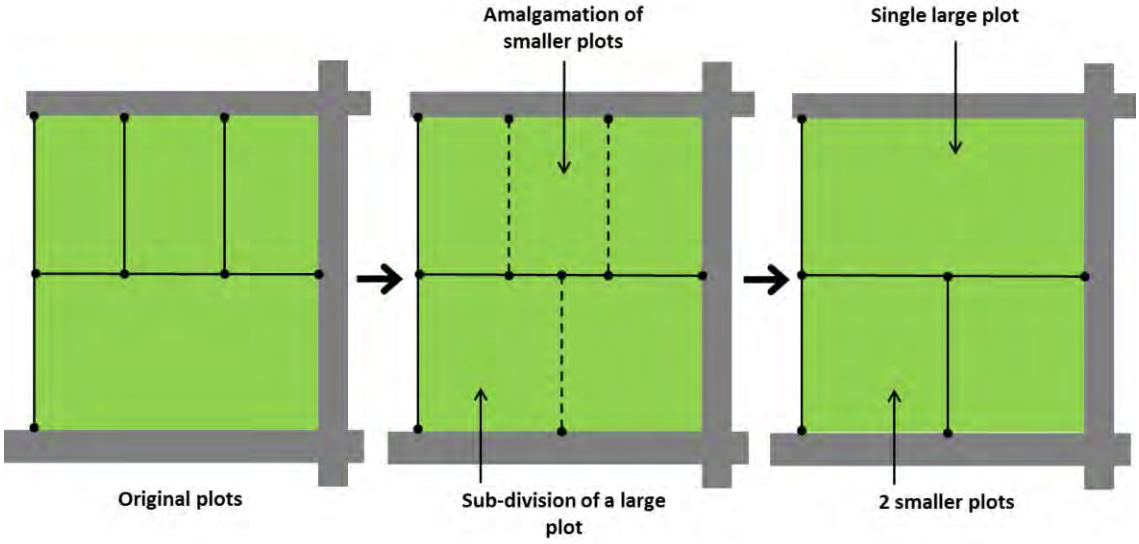
目標 1	ティラワ SEZ の開発意図に合致した実現可能な開発基本計画を策定する。
方針	土地やインフラの配置を最適化する。また、ティラワ SEZ の一部は起伏に富んだ地形となっており、開発コストを抑制しつつ、必要な開発が確保される方法を提案することが重要である。

目標 2	ティラワ SEZ 内の土地空間の利活用を最適化する。
方針	道路やインフラは産業向けインフラの要求を満たすことが求められる。また、土地の区画割は、入居企業のニーズに応じて分割・統合できる柔軟性を確保するほか、小規模なテナントが入居可能な貸工場を想定する。

目標 3	各産業クラスターにとって適切かつ信頼できるインフラを備えた区画割とする。
方針	数多くの戦略的産業の入居企業を誘致・維持し、特区の評判を高めることが重要となる。

目標 4	関連施設を備えた効率的なインフラを整備し、SEZ 内での円滑な操業を可能とする。
方針	50MW クラスのガス火力発電所の整備を計画し、投資の阻害要因となってきた電力問題に対応する。その他、迅速な操業開始を可能とする貸工場や、人員・物流等の流通を支える輸送システムも整備されることを想定する。

開発基本計画においては、ティラワ SEZ の土地利用の最適化を図る観点から、土地区画を直方形で標準化し、入居者のニーズに応じて容易に分割・統合することを可能にすることを想定する。これにより、土地区画の柔軟な配置が可能になると考えられる。



（出典）JICA 調査団

図 5.2.2 土地区画の分割･統合

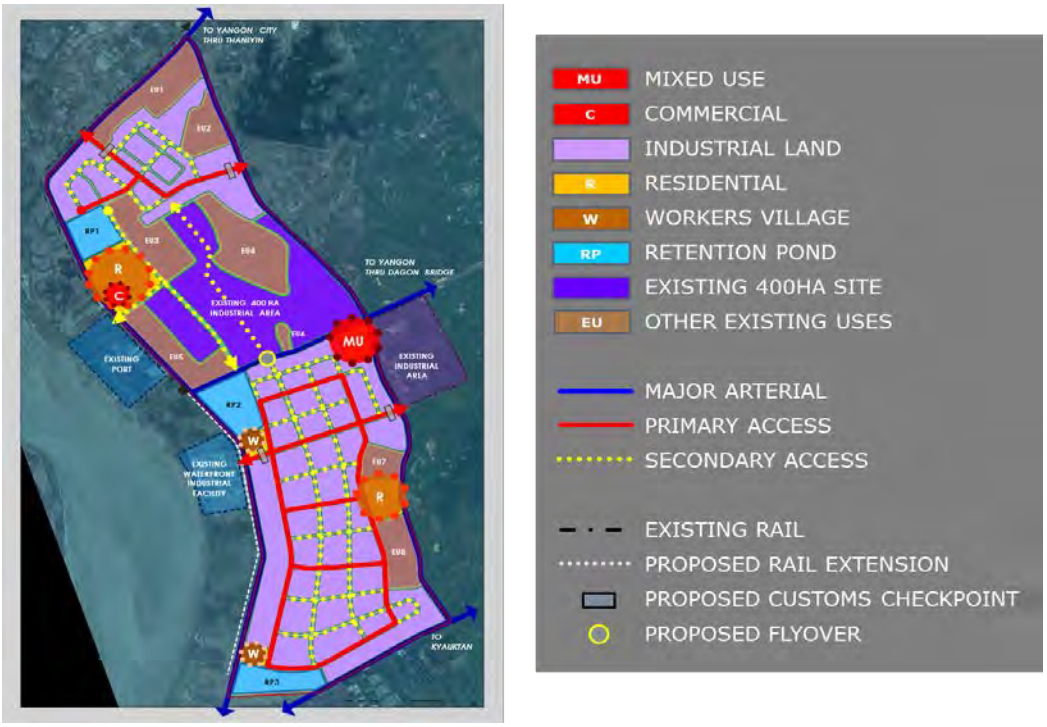
5.3 アプローチ

（1）開発基本計画の大枠

文献調査で得られた内容に基づき､ティラワ SEZ について 2 つの開発基本計画案を作成した。

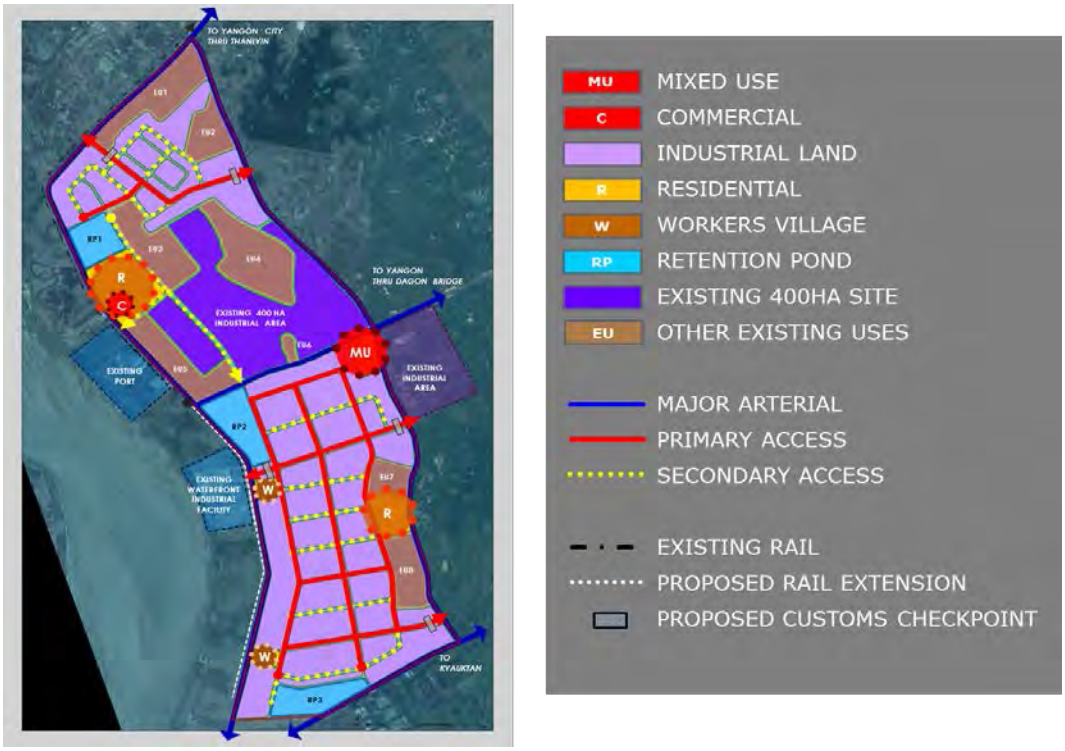
いずれの計画案においても、ティラワ SEZ への正門を開発区域の中間地点に設置した。北部は工業用地となっており、早期開発区域（400ha）と一体的に開発することが可能となるよう留意した。また、河川や起伏に富んだ地形を考慮し、3 つの調整池を設けて洪水を防止するほか、商業施設は、北西部の居住区画内に設けられ、住民のニーズを満たすことを念頭に置いている。住居に関しては、いずれの案でも十分な区画サイズを確保している。

2 案の違いは、まず、計画案 1 は工業用地から居住区への交通アクセスを確保している。また、計画案 2 は、早期開発地域の居住区内を産業用の輸送路が通過しない案となっている。



（出典）JICA 調査団

図 5.3.1　計画案1

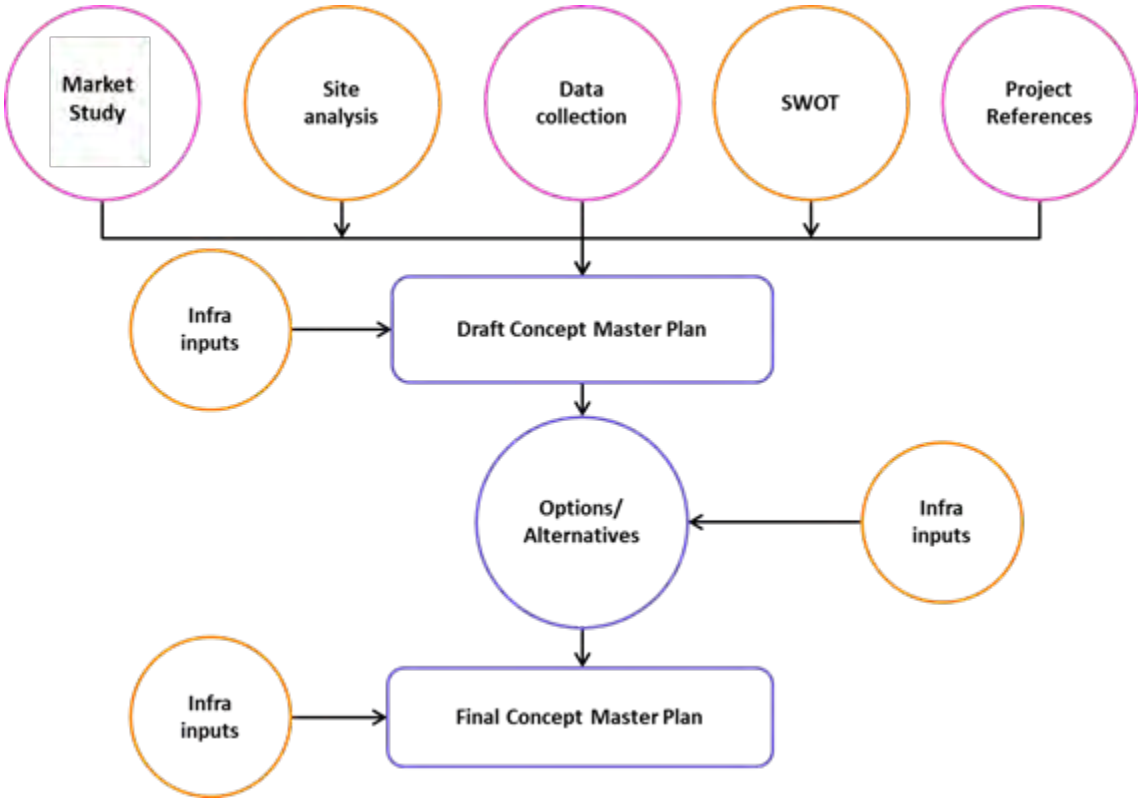


（出典）JICA 調査団

図 5.3.2　計画案2

（2）開発基本計画の検討方法

開発基本計画の検討にあたっては、各種情報源からの情報収集・分析を行った。ティラワ SEZ 現地調査・現地関係者とのディスカッションや、先行研究を対象とした文献調査、市場調査などを通じて得られた情報を踏まえつつ、実現可能性を考慮し、開発基本計画の検討を行った。



（出典）JICA 調査団

図 5.3.3 ティラワ SEZ の検討プロセス

5.4 前提条件

5.4.1 経済特別区（SEZ）

ここでは、ティラワ SEZ の開発基本計画の検討に資する観点から、SEZ のコンセプトを整理し、諸外国の優良事例を参照する。

経済特別区（Special Economic Zone）は、行政手続の簡素化や、良好なインフラ環境を特徴とする。そして、特別法により、SEZ 内における経済活動、特に輸出入に関する優遇措置や規制緩和などが導入されていることも特徴である。世界各国が、投資や外貨を呼び込み、雇用を創出し、ひいては技術革新・インフラ発展につながることを目的として導入しているものである。多くの場合、SEZ は壁や金網で囲われた地域となっており、出入りする箇所が定められている。

なお、SEZ に類似した概念として、自由貿易区（Free Trade Zones：FTZ）や輸出加工区（Export Processing Zones）、フリーゾーン（Free Zones）、工業団地（Industrial Estates）、自由港（Free Ports）などがある。

以下、アラブ首長国連邦・ドバイのジェベル・アリ自由経済区およびシンガポールのシンガポール自由貿易区の２事例を参照し、ティラワ SEZ の境界管理の考え方について検討をする。

（1）ジェベル・アリ自由経済区（アラブ首長国連邦・ドバイ）

アラブ首長国連邦のドバイのジェベル・アリ自由経済区では、免税積み替えや再輸出業務を取り扱う工業用地は囲われており、ジェベル・アリ港に面する工業用地には 7 カ所の通行口が設けられている。多国籍企業の本部やオフィス棟、自由経済区内で操業する必要のない中小企業、ジェベル・アリ自由経済区管理会社などは、工業用地外の隔離されていない地域に所在している。伝統的な自由経済区では、このように内外のアクセスを厳格にコントロールすることが特徴的である。

（※工業用地に設けられた 7 箇所の通行口は図中赤囲み）

（出典）JAFZA ウェブサイト

図 5.4.1.1 ジェベル･アリ自由経済区

（2）シンガポール自由貿易区（シンガポール）

シンガポールは自由貿易区法に基づき、港での荷の積替えや輸出入が監督され、国全体が自由港となっている。一般的な経済特別区では周囲との間に壁が設けられているのと異なり、シンガポール自由貿易区は物理的な障壁・境界が設けられていない。陸路・海路・空路によるアクセスは政府の厳格なコントロール下にあることが特徴である。

（※図中の赤点線黄色囲みが内外のアクセスポイントである。陸路については Woodlands および Tuas 検問所、海路については Jurong、Pasir Panjang、Keppel、Tanjong Pagar、Brani 港、空路については Changi 空港において出入りが監督されている。）

（出典）JICA 調査団

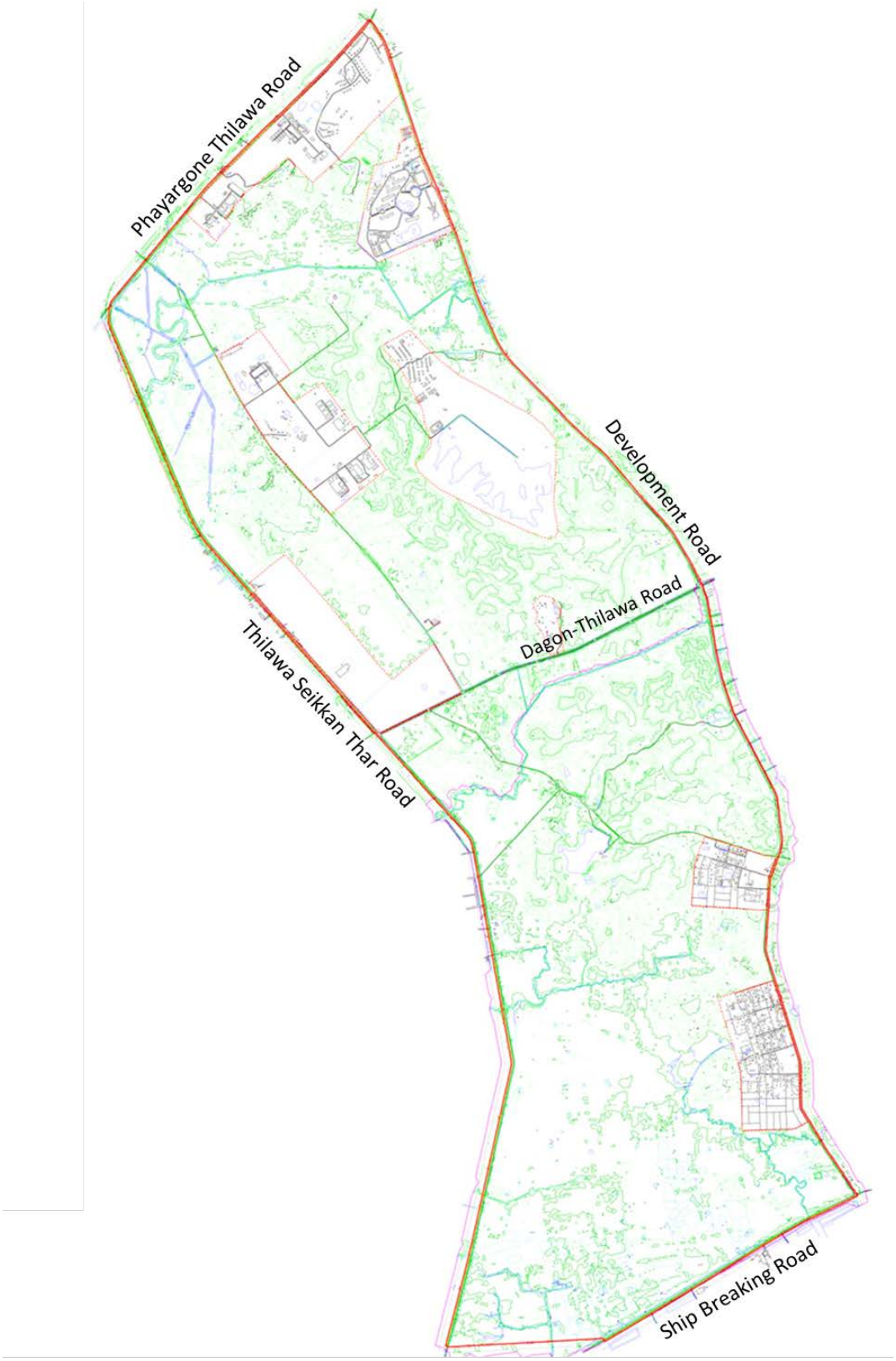
図 5.4.1.2 シンガポールの自由貿易区

（3）ティラワ SEZ における境界管理の考え方

ティラワ SEZ は､建設大臣により認められた既存の 5 つの道路が公式の境界線となっている。具体的には、次ページの図の通り、Phayargone Thilawa Road（北側)、Development Road（東側)、Ship Breaking Road（南側)、Thilawa Seikkan Thar Road（西側)、そして Dagon Thilawa Road（中央）の 5 つの道路である。

このうち、西側の Thilawa Seikkan Thar Road はティラワ港へのコンテナ搬入に使われている。現地調査を通して、通関に時間がかかることから深刻な渋滞が発生している状況が確認されている。そのほかの 4 道路は、ティラワ SEZ の一部として建設されることが想定されるが、公共交通のために利用されると考えられる。

開発基本計画では、ティラワ SEZ 内の工業用地のみをフェンスで囲み、税関のチェックポイントを設けるとともに、その他のエリアは、SEZ 内に居住区や小川があることを踏まえて外部と物理的に隔離しないよう留意した。



（出典）JICA 調査団

図 5.4.1.3 ティラワ SEZ を形成する道路網

5.4.2 土地用途

（1）SEZ における土地利用・施設配置の考え方

経済特区は、各種の土地利用を組み合わせて開発されることが重要である。これにより、工業用地の比較的低い収益性を、商業・居住施設の高い収益性が補うことができるほか、産業ごとのニーズに対応する専門性が高まると考えられる。

この点、次世代型ともいえる経済特区では、伝統的な経済特区では見られなかったビジネスサポートサービスの提供や専用施設の導入が行われるようになっており、伝統的な経済特区よりも優れている例が多い。専用施設の例を示すと次の通りである。

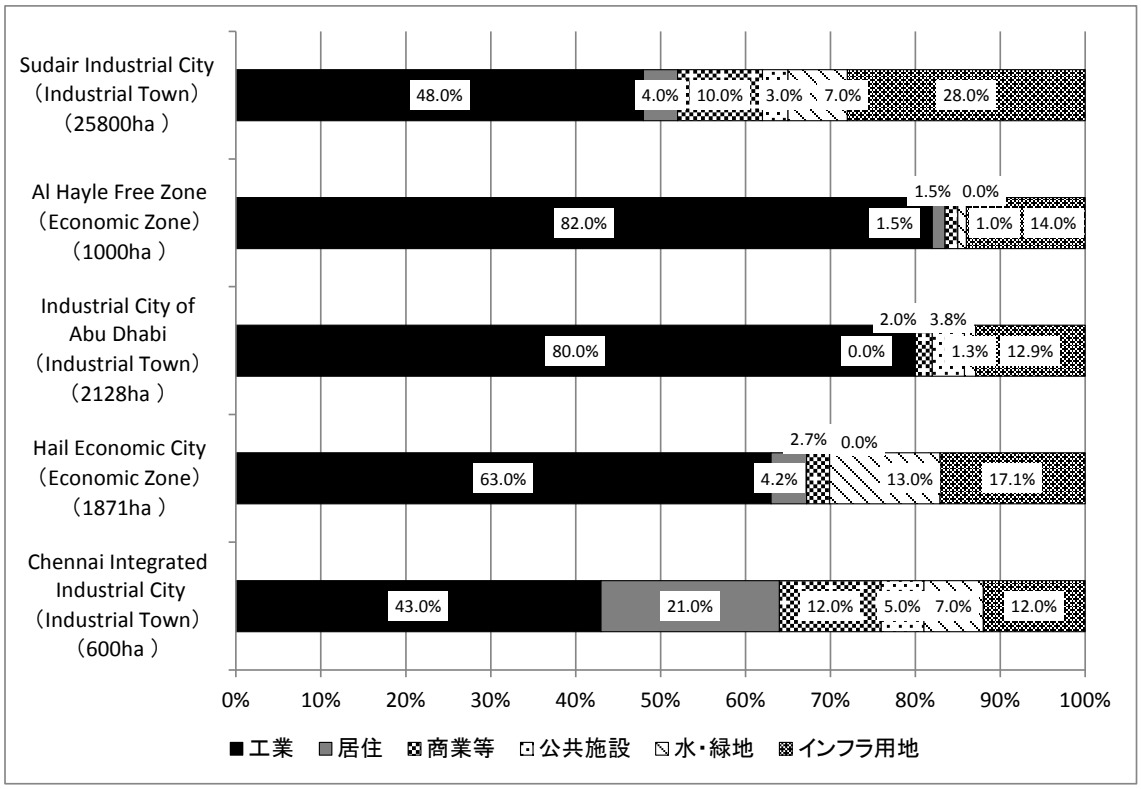
- 保育施設
- 医療施設
- 会議場
- 展示場
- ショッピングセンター
- トレーニング施設
- 避難所
- 修理・メンテナンスセンター
- 社会的弱者向け公共施設
- インキュベーション施設
- 銀行
- 住居
- 税関および貿易ロジスティックス関連施設
- 高速情報通信サービス、ネットワーク関連施設

ティラワ SEZ の開発基本計画では、製造業をフェンスで囲われた一定の区画内に配置する一方、非製造業や各種施設はフェンスで囲われていない区画内に配置し、SEZ 内外のアクセスをより自由に行うことを可能にすることを想定した。

なお、諸外国からの投資家は、ティラワ SEZ に関して特別に制定された法に基づいて、SEZ 内の土地を上限 75 年の長期リースで使用することができるようになっている。

（2）経済特区開発の国際比較

ティラワ SEZ の開発基本計画において、土地空間の利活用の最適化を図る観点から、土地利用のベンチマークとして、諸外国の経済特区の開発面積、土地区画の用途別割り当て、インフラ等について分析する。ここではアラブ首長国連邦の Industrial City of Abu Dhabi、Al Hayle Free Zone（フジャイラ）、インドの Chennai Integrated Industrial Township、サウジアラビアの Sudair Industrial City、Hail Economic City（リヤド）の５つを比較事例のサンプルとした。各産業用地のコンセプト・規模および土地利用の内訳は次の通りである。



（出典）JICA 調査団

図 5.4.2.1 各国経済特区の土地利用状況

これらの先行事例を踏まえると、用地の７割を工業用地とし、残りの３割を道路や公共施設、緑地等に割り当てることが、用地の最適かつ効率的な利用方法であると考えられる。

ティラワ SEZ の開発基本計画においては、洪水防止および水辺の環境保全のために貯水池を設けるほか、宗教上重要な土地を保護する必要があるため、工業用地とその他区域との比率は「6：4」程度であることが望ましいと考えられる。

（3）立地

ティラワ SEZ は、ヤンゴンの南東の Kyauktan Township に位置しており、ティラワ港に隣接する。国際協力機構（JICA）とヤンゴン市開発委員会（YCDC）による the Strategic Urban Development Plan of Greater Yangon では、Kyauktan が開発の対象となっており、既存の道路網の更新や都市大量高速輸送（Urban Mass Rapid Transit：UMRT）システムの導入等の交通網の強化が想定されていることから、ティラワ SEZ の開発に影響を与えるものと考えられる。

（4）現地調査結果

ティラワ SEZ には、ヤンゴンからは Thanlyin Bridge と Dagon Bridge を経由してアクセスすることができる。また、ティラワコンテナ港に沿った立地であり、既存の民間所有の工業開発地域に隣接している。ティラワ SEZ を囲む既存の開発物件は、将来的な拡張計画に影響を与える可能性がある。

また、SEZ 内の北部に存在する貯水池や川の支流については、原生生物の生態系が確認されており、適切に保全される必要がある。SEZ 周辺の状況は次の図の通りである。

（※図中赤囲み内がティラワ SEZ）

（出典）JICA 調査団

図 5.4.2.2 Kyakutan 内ティラワ SEZ 概観図

現在の Kyauktan は、質素な田園風景が広がっているが、道路はコンクリートにより舗装されている。主な産業は、農業および水産業である。

図 5.4.2.3　Kyauktan の現在の街並み

ティラワ SEZ 内にはミャンマー海洋大学が所在しているほか、宗教施設であるパゴダ（pagoda）が 4 つ所在している。開発基本計画においては、これらの施設への交通路も配慮する必要がある。

また、民間企業による開発が行われ、道路建設が行なわれている場所もある。いくつかの工場施設が確認されているものの、重工業の製造活動は確認されていない。

（※概観図の右上の囲み内に、ティラワ SEZ 全体との位置関係を黄色点線囲みで示した。）

図 5.4.2.4 ティラワ SEZ 外部の現在のティラワ工業用地の道路状況

ティラワ SEZ の西側には川沿いにティラワ港がある。現地調査を通して、南北を結ぶ道路沿いに大型の産業施設が確認されている。ティラワ SEZ の南端の外側には 327 ヘクタールの船舶解体ヤードとエビ養殖場がある。また、木材の輸出も行われている。

（※概観図の右上の囲み内に、ティラワ SEZ 全体との位置関係を黄色点線囲みで示した。）

図 5.4.2.5　ティラワ港湾地域の現況

ティラワ SEZ の南部境界沿いには、451 ヘクタールと 251 ヘクタールの 2 つのエビ養殖場があり、近隣住民が働いている。ティラワ SEZ の開発基本計画の策定においては、これらの養殖場に悪影響が及ばないように留意する必要がある。

（※概観図の右下の囲み内に、ティラワ SEZ 全体との位置関係を黄色点線囲みで示した。）

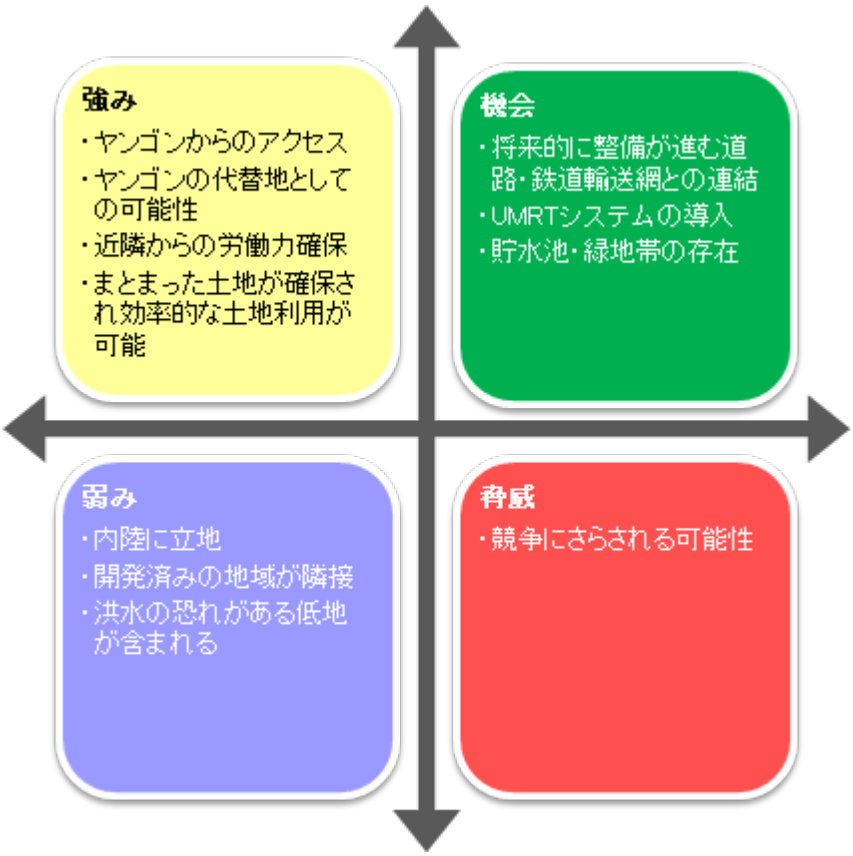
図 5.4.2.6　ティラワ SEZ 南隣のエビ養殖場

ティラワ SEZ 近隣 Kyauktan 内では、次のような中・上流階級向けの住宅の分譲が行なわれている。

図 5.4.2.7　Kyauktan 内ティラワ SEZ 近隣の新規住宅

（5）SWOT 分析

ティラワ SEZ に関する SWOT 分析を行った。その結果は次の通りである。



（出典）JICA 調査団

図 5.4.2.8　ティラワ SEZ についての SWOT 分析

ティラワ SEZ に関する SWOT 分析の「強み」および「機会」の詳細は次の通りである。

表 5.4.2.1 ティラワ SEZ の強み・機会

強み	ヤンゴンからのアクセスの良さ	ヤンゴンから２つの橋（Kyauktan-Thanlyin Bridge および Dagon Bridge）を経由してアクセスすることが可能
	ヤンゴンからの代替地としての選択肢	ヤンゴン中心地から約 20km の距離に立地しており、中心地の混雑を分散する効果を持つこと
	労働力確保の見込み	Kyauktan と Thanlyin からの労働力（および潜在労働力）を確保できること
	整然とまとまった土地	ティラワ SEZ は南北に長く連続した土地であり、分譲開発が可能である
機会	道路・鉄道輸送網の整備	ヤンゴンの開発計画の中で、道路網の整備が予定されている。また、既存の鉄道路線はティラワ港および SEZ までの乗客・貨物輸送のために強化される予定である
	UMRT システムの導入	Kyauktan に導入される予定の UMRT システムは、Kyauktan とティラワ SEZ の間のアクセスを改善する
	貯水池の存在	適切に開発された場合、ティラワの工業地帯に緑地帯を提供することができる

（出典）JICA 調査団

一方、「弱み」および「脅威」の詳細は次の通りである。

表 5.4.2.2 ティラワ SEZ の弱み・脅威

弱み	内陸での立地	現在の立地は将来的にさらなる拡張を行うことに対応できない
	開発済み地域が隣接	一体的な開発と SEZ 外へのアクセスの阻害要因となる可能性がある
	洪水に合いやすい低地	洪水対策のため高コストな調整池を建設する必要がある
脅威	競争にさらされる可能性	ヤンゴンの既存の工業団地との競争にさらされること

（出典）JICA 調査団

5.5 検討経緯

ここでは、ティラワ SEZ の土地利用・開発基本計画の検討経緯を記す。

5.5.1 第 1 次案

第 1 次案では、ティラワ SEZ における 2,000ha の土地利用の基本認識として、以下の点に留意した。

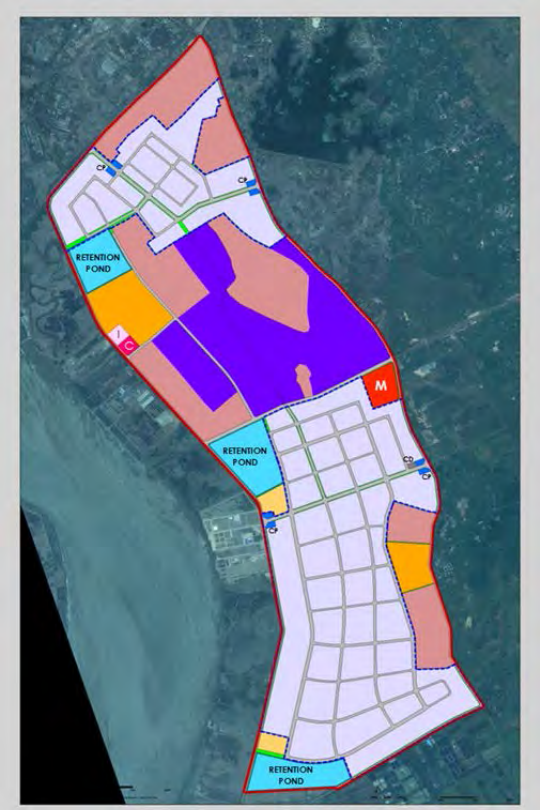
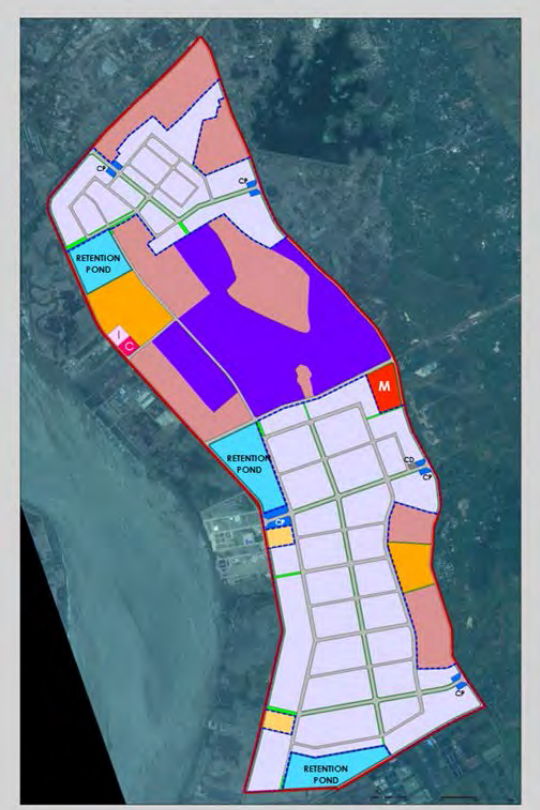
- ティラワ SEZ の境界線の外部における既存の産業施設並びに早期開発区域 ZoneA の北部に位置する自然・河川は、ティラワ SEZ 開発に際し留意すべき点となる。
- SEZ の境界線となる道路は、将来の周辺開発を視野に中長期的視点に基づき整備されることが望まれる。
- SEZ 内の道路は、市場調査結果を踏まえ、入居企業・投資家のニーズに対応した区画サイズを設定できるように整備されることが望まれる。
- 関連施設は、単に商業・住居機能を備えた複合施設としてではなく、SEZ に必要不可欠な機能として導入することを念頭に置く。開発基本計画では、関連施設が 2 か所に集約されることを想定しつつ、これらの近接性（距離）についても十分に考慮する。
- 住居区画は、セキュリティーの観点等からフェンスで囲まれ通行門を設置する必要があるが、税関のチェックポイントを出入りする必要がないよう、良好なアクセスを確保するよう留意する。

こうした点を踏まえ、土地利用・開発基本計画の基本的な骨格について、2 つの案を検討した。計画案 1 と 2 の主な違いは、SEZ 内の道路配置の相違によって土地利用の効率性が異なっていること及びその他の見地からそれぞれに特徴が生じている点である。

2 案を検討した結果、工業用地の面では、より広い区画が確保できる計画案 2 が望ましい一方、早期開発区域 ZoneA の道路を通して北部と南部の工業用地を接続できる点では、計画案 1 が望ましいとの考え方に至った。

これを踏まえ、ティラワ SEZ の基本的な骨格は、計画案 1 及び 2 のハイブリッド型が望ましいとの結論となった。

計画案 1 及び 2 を比較検討の概要は、次の通りである。

Option 1	Option 2
	
1. Land efficiency achieved: 70%	1. Land efficiency achieved: 72%
2. Wider Main Loop system: This is to accommodate roadside parking in the future.	2. Three Main Spine system: This is to channel and distribute the expected high volume of industrial traffic within the industrial zone.
3. There is flexibility for large MNCs or big investors to take up large parcels as big as 20 hectares in size.	3. Larger parcels are purposely planned to allow for easier configuration for major investors and flexibility for internalized linkages to allow for SMEs.
4. Option 1 allows for a possible link through the 400 ha Zone A site and to the northern part of TSEZ.	4. Option 2 conceptualizes two distinct parcels for TSEZ, delineating a clear boundary between the northern and southern areas of TSEZ.

(出典) JICA 調査団

図 5.5.1.1 ティラワ SEZ の土地利用:計画案 1 及び 2 の比較検討

表 5.5.1.1 ティラワ SEZ の土地利用:計画案 1 及び 2 の比較検討(用途別面積)

Land Use	OPTION 1		OPTION 2	
	Area (ha)	%	Area (ha)	%
Overall TSEZ boundary	*2,887*	*100*	*2,887*	*100*
Bonded Zone	*1,508*	*52*	*1,500*	*52*
Industrial	1,209	42	1,223	42
Commercial	5	0	5	0
Mixed Use	23	0.8	23	0.8
Residential	110	3.8	110	3.8
Workers' village	22	0.8	23	0.8
Institutional	5	0	5	0
Civil Defence	1	0	1	0
Customs Checkpoints	16	0.3	9	0.3
Green & open space	63	2.2	47	1.6
Retention ponds	177	6	178	6
Roads	288	10	295	10
400-ha Industrial Park	443	15	443	15
Other Existing Use	525	18	525	18

(出典) JICA 調査団

5.5.2 除外区域の指定及び環境保全の観点からの修正

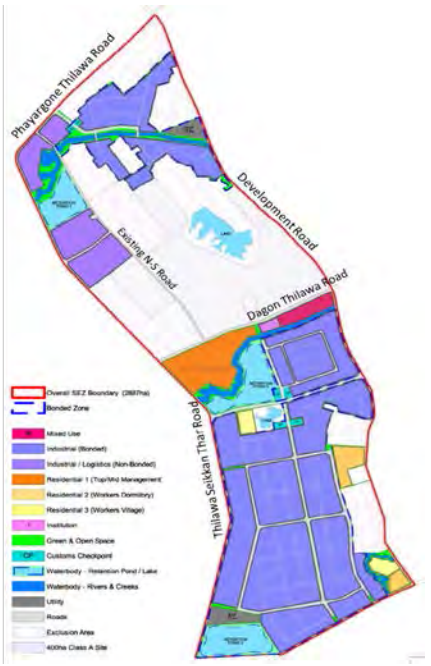
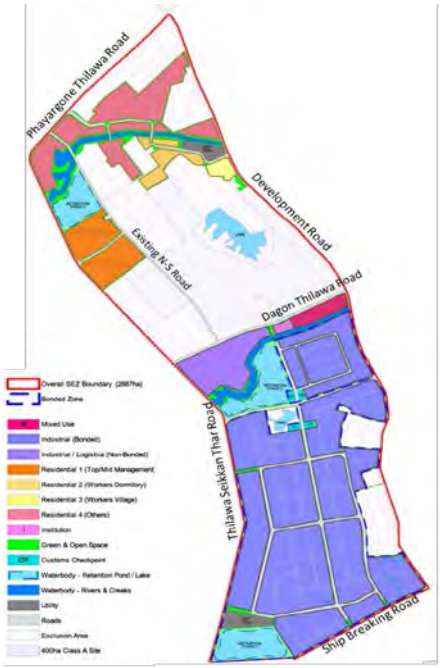
第 1 次案(計画案 1 及び 2)を検討した後、環境・社会配慮に関する調査を通して、ティラワ SEZ 予定地に内に宗教施設であるパゴダ(pagoda)や河川の支流、原生生物の生態系等が確認された。これらは、SEZ 内の各種機能の配置に影響を与える重要な要素であり、第 1 次案について、以下の除外区域の指定及び環境保全の観点から修正を行った。

表 5.5.2.1 ティラワ SEZ における除外区域の指定及び環境保全の観点からの修正のポイント

【新たな除外区域の指定】
- Ministry of Industry power distribution plant [0.849 ha]
- Area appropriated for the factory construction by Ministry of Industry [15.39 ha]
- Myanmar Economic Cooperation's galvanized iron sheet factory and shoe factory [42.26 ha]
- Church [0.2998 ha]
- Phalankanoo Monastery [1.091 ha]
- Phalanywaroo Pahayalay Monastery [1.052 ha]

【環境保全の観点からの修正】
- Aiyun Zok C and the river tributary
- Shwe byauk C and the river tributary
- The south-most east corner river tributary off 'Thi da Maying'
- South lake surrounding Site 13 – Phalankanoo Monastery

(出典) JICA 調査団

REVISED OPTION 1	REVISED OPTION 2
	
1. Optimized as a 'Special Economic Zone'. • Efficiently allocated industrial plots which are in line with market study recommendations. • Areas are secured for necessary supporting facilities (residential, commercial, education, medical etc.) • Industrial area can be segregated by physical fence with controlled accesses via customs checkpoints.	1. Essentially, Option 2 comprises the same traits as Option 1 except that the Residential areas are no longer decentralized but rather centralized into one location, i.e. located to the north of TSEZ.
2. Water areas and public access areas are preserved. Locations of retention ponds are downstream of TSEZ with water flow final discharge to Yangon River on the west of TSEZ. The reserved creeks are to be widened to act as main drainage route.	2. This arrangement resulted in reduction of industrial land area while the number of residents in TSEZ is now increased by 40,000.
3. Maximized rectangular-shaped plots for industry use. Utilized residual areas for non-industrial uses.	
4. Can be bonded into three zones with controlled access via customs checkpoints while Residential and Mixed Use areas are out of bonding concept for easier access.	
5. As TSEZ is a longish site, the main spine road is designed based on North-South direction with primary loop system with parallel secondary roads to link up to smaller parcels.	

（出典）JICA 調査団

図 5.5.2.1　除外区域の指定及び環境保全の観点からの修正（計画案 1 及び 2）

表 5.5.2.2 ティラワ SEZ の土地利用：計画案 1 及び 2 の比較検討（用途別面積）（修正後）

Land Use	REVISED OPTION 1		REVISED OPTION 2	
	Area (ha)	%	Area (ha)	%
Overall TSEZ boundary	*2,887*	*100*	*2,887*	*100*
TSEZ excluding Exclusion Areas (671ha) & Zone A (400ha)	*1,819*		*1,819*	
Bonded Zone (including roads)	*1,229*	*68*	*1,060*	*58*
Industrial (Bonded)	856	47	766	42
Industrial (Non-bonded)	130	7	79	4
Mixed Use	21	1	21	1
Residential (Top/ Middle Management)	110	3.8	110	3.8
Residential (Workers' Quarters)	32	2	31	2
Residential (Workers' Village)	20	1	11	1
Residential (Others)	0	0	156	9
Institutional	5	0	5	0
Customs Checkpoints	12	1	8	0
Green & open space	140	8	143	8
Water body - Retention ponds	132	7	132	7
Water body – Rivers & creeks	65	4	65	4
Roads	295	16	287	16
Utilities	31	2	31	2

（出典）JICA 調査団

除外区域の指定及び環境保全の観点からの修正を踏まえ、工業用地がより広い計画案 1 では、面積 986ha、総区画数 440 を確保することが可能となる。これらは、誘致候補産業の多様なニーズに対応し、中心的な入居企業には大型区画を準備できる一方、小規模なテナント向けには、迅速に事業を開始できるよう貸工場を備えた小規模区画を手当てすることを想定する。

表 5.5.2.3 計画案 1 における工業用地の区画サイズ・区画数（産業別配分）

Plot Size (in hectares)	No. of plots	Industry examples
Less than 1.5 ha	264	Food & Beverage, Construction materials, Chemicals, Electrical & Electronics, Machinery & Equipment, Wood and wood-related products and Logistics.
1.6 – 2.5 ha	95	Automotive, Logistics.
2.6 – 3.5 ha	25	Textiles, Construction materials, Electrical & Electronics, Machinery & Equipment and Wood and wood-related products.
3.6 – 4.0 ha	13	Food & Beverage
4.1 – 8.0 ha	24	Automotive
8.1 – 10.0 ha	13	Automotive
More than 10.0 ha	6	Automotive
Total	440	

（出典）JICA 調査団

5.5.3 Zone B 開発検討に伴う修正

上述の修正の後の検討過程において、早期開発区域 Zone A に続いて、新たに Zone B として先行的に開発する区域を設定する案が生じ、これを踏まえてティラワ SEZ 全体の土地利用・開発基本計画を検討した。また、検討中の計画案に対し、建設省からの意見も提示された。

検討中の計画案に対して寄せられた建設省及びその他関係者の主な意見は以下の通りである。

表 5.5.3.1 土地利用･開発基本計画案に対する関係者の主な意見

【建設省の主な意見】

・ティラワ SEZ 内の河川を保全し、SEZ 外への排水機能を十分に考慮する。
・住居区画面積を最小限に抑えつつ、就業者向け住居の潜在需要を精査する。また、住居区画を川沿いに設定し、良好な生活環境を構築する。
・物流向け区画は、港湾との連結性・近接性を考慮する。
・水処理・水道施設等のインフラに留意する。
・ヤンゴンーティラワ間の交通・輸送手段としての鉄道網の整備に留意する。

【その他関係者からの主な意見】

・早期開発区域 Zone A に続いて、ティラワ SEZ 南側エリアの北部において、新たに先行的に開発される Zone B を検討する。
・住宅密度を見直すとともに､ティラワ SEZ 内の就業者数予測を 213,149 人から 142,244 人に修正する。
・ティラワ SEZ 内の住宅開発に対して高い需要が見込まれ、SEZ 内に 2 つの住居区域を設定する。
・ティラワ SEZ に隣接する石炭火力発電所の建設が検討されていることから、同発電所から排出される石炭灰を集積する用地が必要である。

（出典）JICA 調査団

これらの意見を踏まえ、計画案の修正に際しては、ティラワ SEZ 開発の関係者により以下の方針が確認された。そして、日ミャンマー関係者により、①除外区域と SEZ 全体の一体性を確保する、②ティラワ SEZ の外周道路の開発を考慮する、③早期開発区域（Zone A、Zone B）開発の進捗を視野に入れた住居区画整備のフェージングを検討するとの条件の下、土地利用・開発基本計画の大枠が了承された。

表 5.5.3.2 土地利用･開発基本計画案の修正に関する基本方針

- 早期開発区域 Zone A に続いて先行的に開発される Zone B のエリアを、ティラワ SEZ 全体の開発基本計画から除外する。
- 物流向け区域は、港湾に沿ったティラワ SEZ の西側南部に配置する。
- ティラワ SEZ 内の全ての河川が保全される。
- ティラワ SEZ の北部エリアは主に住居向け区画とする。
- ティラワ SEZ の南部エリアの北側に、物流・輸送施設向けの保留地・複合用途区域を設定する。同区域は、ティラワ周辺地域の交通・輸送のハブとなるほか、その他補完的な土地利用向けとして検討される。
- 労働者向け住居区画はティラワ SEZ の東側に設定する。
- ティラワ SEZ の西南端に石炭灰置き場向けの区画を確保する。

（出典）JICA 調査団

5.6 開発基本計画の概要

以上の検討を踏まえ、開発基本計画を策定した。開発基本計画における土地用途のレイアウトの考え方は次の通りである。

まず、工業用地と住宅用地を明確にするよう留意し、住宅用地は一部を除き SEZ 内の北部にほぼ集約した。

次に、商業用地と労働者向け住宅用地は、SEZ 外部エリアとの将来的な連結性を考慮し、SEZ 東側の出入口付近に配置した。

工業用地は Zone B の南側に配置し、道路は SEZ 内により多くの標準的区画を設定できるように配置した。

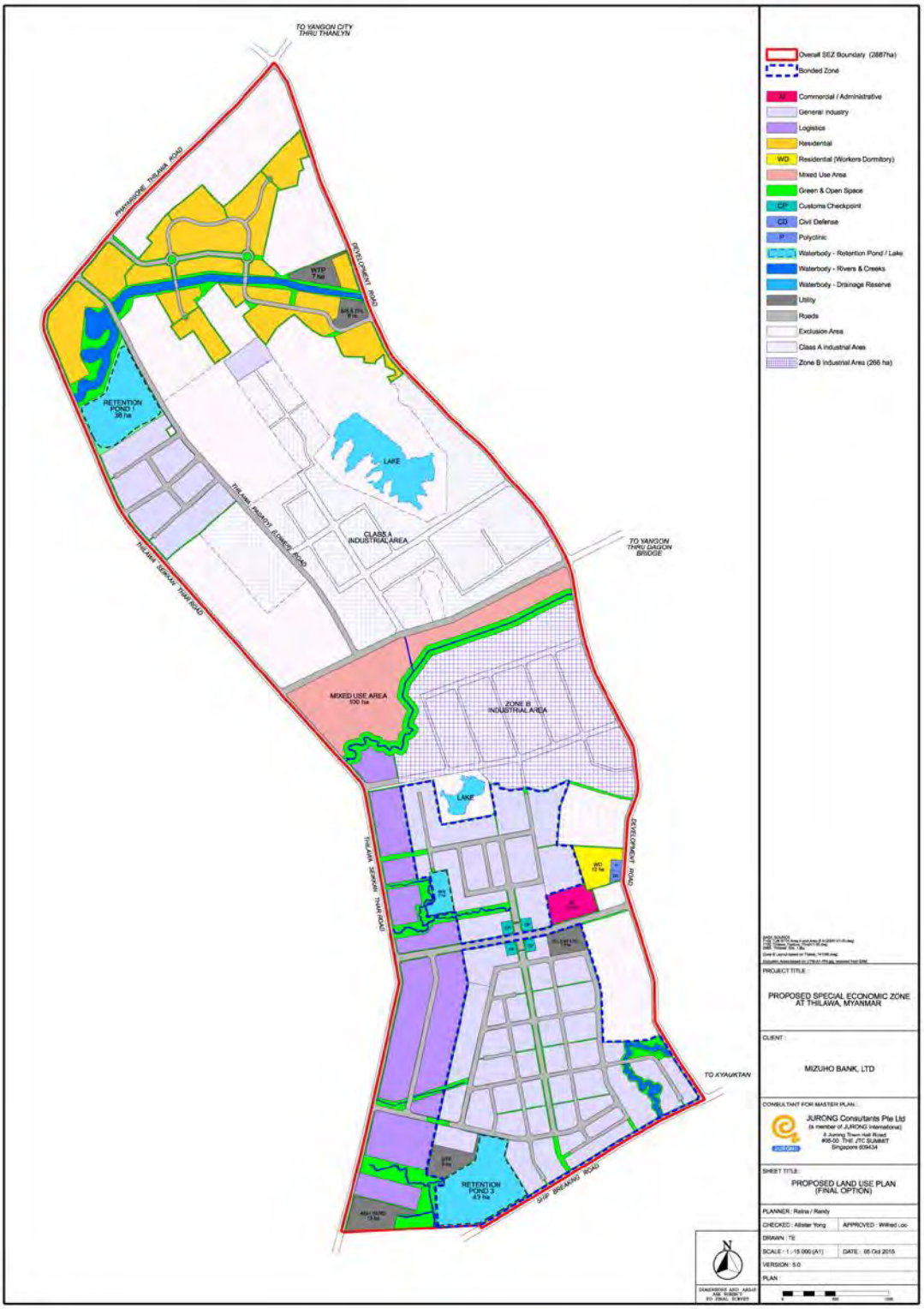
鉄道輸送施設向けの保留地は、SEZ 中央部の複合用途区域内に配置した。将来的に、周辺地域の交通・輸送ハブとなることが想定される。

このほか、総合病院と民間警備施設を、労働者向け住宅用地に隣接して SEZ 東側に配置した。総合病院の利用は、ティラワ政府関係者の要請に基づき、ティラワ SEZ の就業者に限定せず、SEZ 東側の Development Road 沿いに将来的に開発が進められる SEZ 外の住宅地の住民にも開放されることを想定している。また、民間警備施設は、緊急時にティラワ SEZ のどこにでもアクセスできるよう留意し、税関チェックポイントの外部に配置した。

表 5.6.1 開発基本計画における土地利用（用途別面積）

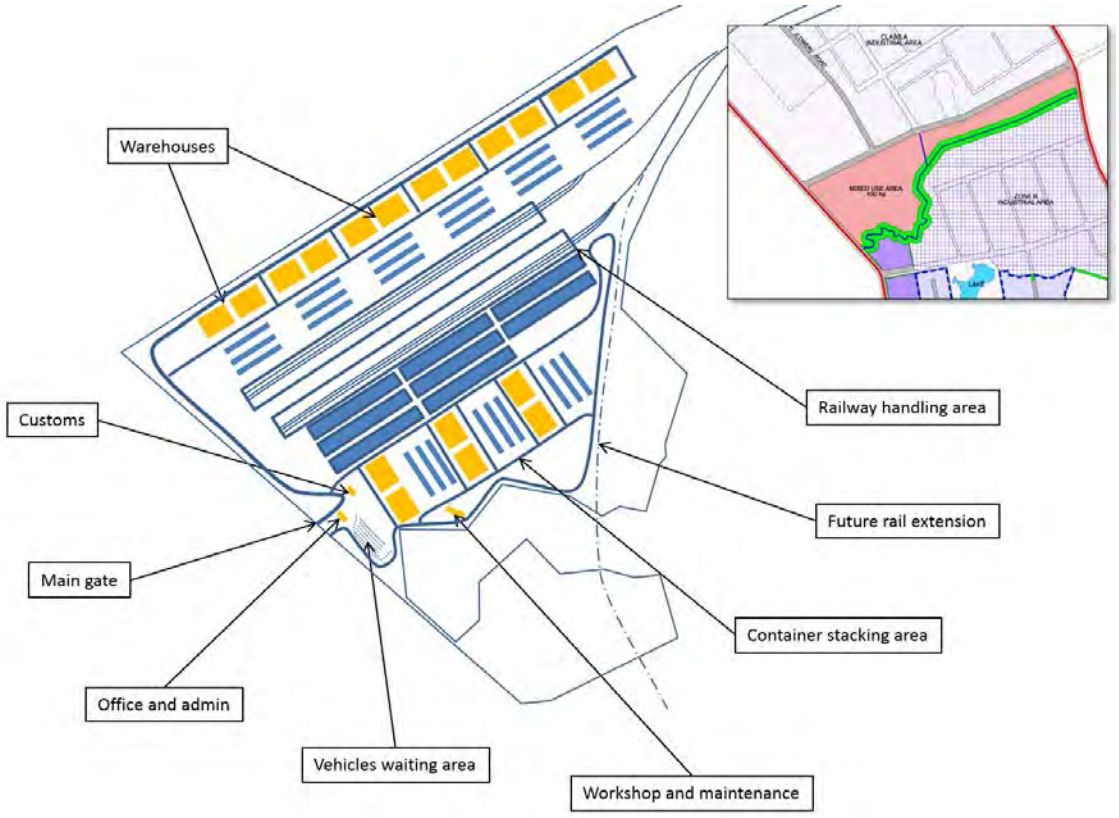
Land Use	FINAL OPTION	
	Area (ha)	%
Overall TSEZ boundary	*2,887*	-
TSEZ excluding Zone A, Zone B & Exclusion Area (net)	1,461	100
Industrial (General)	468	32
Industrial (Logistics)	171	12
Commercial/ Administrative Office	11	1
Mixed Use Area/ Reserve Site	100	7
Residential	185	13
Residential (Workers' Dormitory)	12	1
Customs Checkpoints	5	0
Green & open space (including rivers and creeks)	214	15
Civil Defence	1	0
Polyclinic	1	0
Retention Pond	85	6
Drainage Reserve	3	0
Major Utilities (including Ash Yard)	44	3
Roads (JURONG's proposed roads only)	161	11
Saleable Land	*948*	*65*
Non-saleable Land	*513*	*35*

（出典）JICA 調査団



（出典）JICA 調査団

図 5.6.1　開発基本計画：土地利用レイアウト



（出典）JICA 調査団

図 5.6.2 ティラワ SEZ 内における物流施設（鉄道）配置イメージ

5.6.1 工業区域

市場調査に基づき検討された誘致候補産業を対象として、工業区域における産業別の土地利用区分を整理した。

工業区域における産業配置は、各産業の特性を踏まえて調和させることが不可欠である。シンガポールの事例を踏まえると、産業は一般的に、①軽工業、②一般産業、③特殊産業の 3 つに分類される。ティラワ SEZ の誘致候補産業である 8 業種は、軽工業と一般産業に該当する。

- 軽 工 業：大量の排水・廃棄物や高レベル・継続的な騒音を発生させず、大量の有害物質（溶剤、酸、その他化学製品）を使用しない製造業。染色・漂白・その他仕上げ作業を伴わない繊維・衣料を含む。
- 一般産業：最終製品製造・組立、部分組立等を含む製造業一般。
- 特殊産業：製油所、石油化学・化学工場、有害な産業廃棄物処理施設等、深刻な公害を引き起こす可能性がある業種。

軽工業と一般産業又は特殊産業とは、一般的に近接させることが可能であるが、食品産業は、近隣の他の製造業からの汚染・混入物質を避けるため、特別の扱いが必要となる。近隣施設からの汚染を回避するため、食品産業は専用のゾーンを設定することが望ましい。

食品産業は、事業内容・規模に応じて以下の 3 つのカテゴリーに分類される。

・軽 食 品：乾燥食料品の包装、食品原料・素材の調合、シロップ・果汁飲料の瓶詰
・一般食品：食品加工を含む食料品製造
・特殊食品：食肉処理・保存・缶詰製造、魚介類加工・保存、乳製品

食品産業の配置では、まず、特殊産業と隣接させないように留意が必要である。また、一般産業に隣接させる場合は 50m の距離をおくことが望ましい。通常、これは SEZ 道路及び区画全面のセットバックにより距離を確保することが可能である。

5.6.2 非工業区域

非工業区域は、除外区域を除いたティラワ SEZ 全体の面積の 21%に相当し、合計 315ha である。うち、住居区域が 185ha と、土地利用区分別では最も広い面積を占める。

表 5.6.2.1 非工業区域の土地利用区分

Land Use	FINAL OPTION	
	Area (ha)	%
Commercial/ Administrative Office	11	3
Mixed Use Area/ Reserve Site	100	32
Residential	185	59
Residential (Workers' Dormitory)	12	3.8
Customs Checkpoints	5	1.6
Civil Defence	1	0.3
Polyclinic	1	0.3
TOTAL	315	100

（出典）JICA 調査団

（1）住居

住居区域では 3 つのタイプの住宅を導入することを想定する。

ファミリータイプのマネジメント・中間層向け住宅は、SEZ 北部の河川周辺に配置することで、良好な住環境を確保することが可能となる。他方、一般労働者向けには、SEZ 南部に単身者用アパート・寮を配置し、工業用地へのアクセスを容易にすることに留意した。

住居のキャパシティは、居住者数 33,000～82,000 人を想定する。

表 5.6.2.2 住居区域概要

Residential typology	Land area (ha)	Storey Height	Capacity		Classification of occupants
			No. of Households	No. of residents	
Semi-Detached units	185	2 to 3 storeys per unit	5,310	21,240	Top/ Middle Management
Apartments		12 to 15 storeys per block	15,930	63,700	
Apartments & Dormitory	12	Up to 6 storeys	-	12,000 to 18,000	General workers (singles)

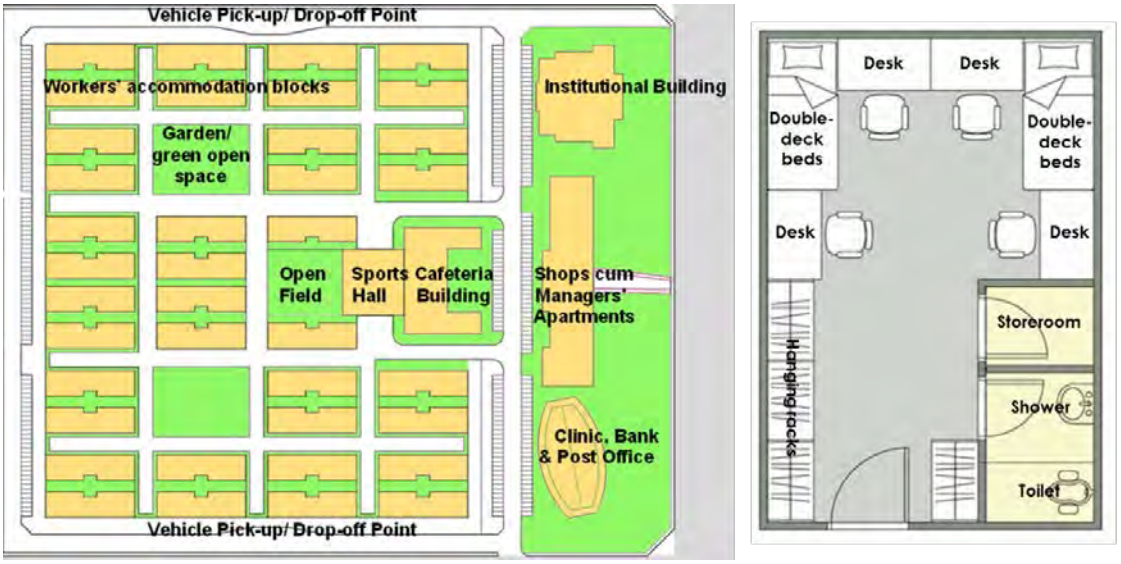
（出典）JICA 調査団

（出典）Holizon Hill, Singapore ウェブサイト、JICA 調査団

図 5.6.2.1 マネジメント・中間層向け住居イメージ

（出典）JICA 調査団

図 5.6.2.2　一般労働者向け住居イメージ



（出典）JICA 調査団

図 5.6.2.3　一般労働者向け住居エリアのコンセプト

（2）商業

商業区域は、面積 11ha、ティラワ SEZ 南側エリアの中央に配置した。一棟のタワービルを建設し、SEZ 管理会社本部や企業の本社、商業施設の導入を図るか、または区画を分けてオフィスビルやショッピングモール等を導入することを想定する。

（出典）URA, Singapore ウェブサイト、JICA 調査団

図 5.6.2.4 商業施設・ショッピングモールのイメージ

（3）複合用途区域・鉄道輸送施設向けの保留地

複合用途区域・鉄道輸送施設向け保留地は、ティラワ SEZ の中央部に配置するのが効果的であると考えられる。100ha の面積を確保し、既存の鉄道網が将来的に延伸し、輸送・交通のハブとなることを想定する。また、ティラワ SEZ の中央を東西に抜ける Dagon-Thilawa Road に面することで、後続的に開発される商業エリアとの連結性が高まることが見込まれる。

（出典）JICA 調査団

図 5.6.2.5 複合用途区域の位置図

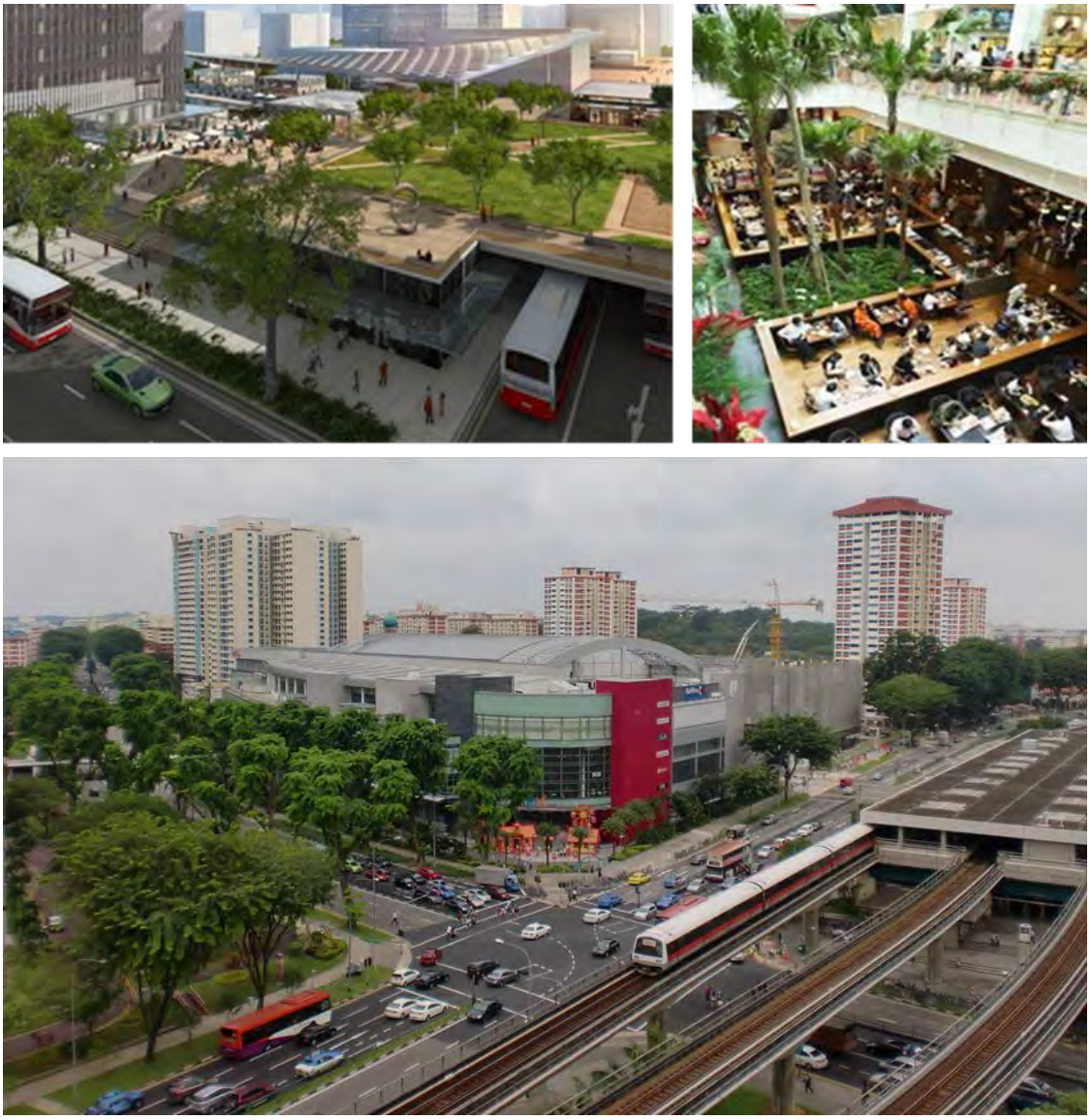


図 5.6.2.6　ティラワ SEZ の輸送・交通ハブのイメージ（例：シンガポール）

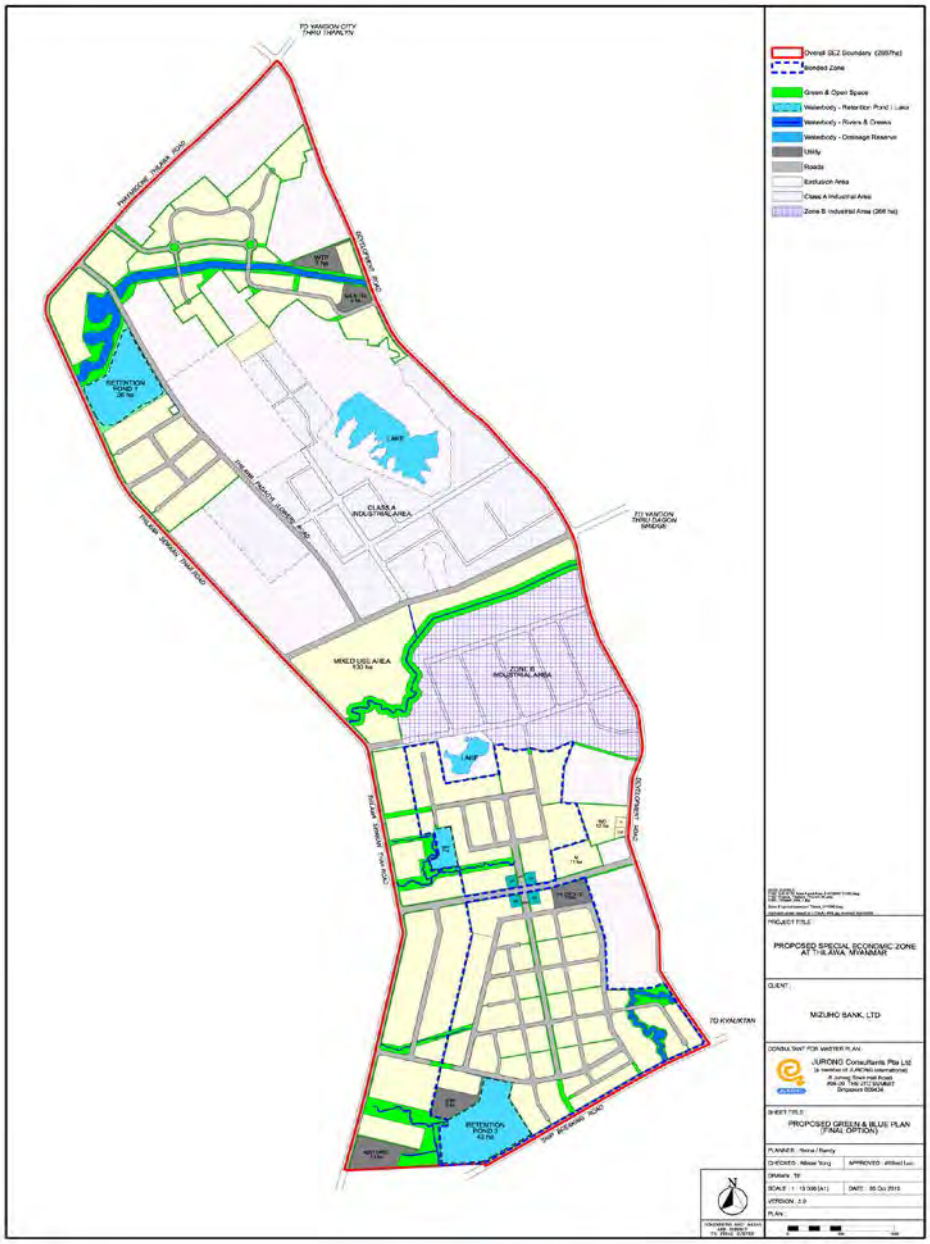
（4）緑地・水環境

自然の生息環境を保全するとの環境省の要請に基づき、ティラワ SEZ の自然や既存の河川を活かして緑地・水環境を保全・整備することが効果的であると考えられる。また、SEZ 対象地の地形を踏まえ、洪水防止の観点から貯水池を整備することも重要なポイントとなる。

緑地・水環境の保全・整備区域の面積は 214ha、除外区域を除いた SEZ エリアの約 15％に相当する。

（出典）URA, Singapore ウェブサイト

図 5.6.2.7 ティラワ SEZ における緑地帯のイメージ



（出典）JICA 調査団

図 5.6.2.8 緑地・水環境の配置図

5.6.3 交通インフラ

ティラワ SEZ の開発基本計画では、工業、商業、住居等の複合的な土地利用・開発を想定し、213,000 人の就業者数を見込んでいる。このうち、77,000 人が SEZ 内に居住し、残りの 14 万人弱は概ね隣接する Thanlyin 及び Kyauktan の住民であると想定した。Thanlyin と Kyauktan の人口は、2030 年に向けて、それぞれ現在の 181,000 人から 785,000 人、48,000 人から 108,000 人に拡大すると予測されており、ティラワ SEZ とこれら街区とを結ぶ公共交通機関の整備が不可欠であると考えられる。

また、ヤンゴンからのアクセスでは、Bago 川にかかる橋を経由する必要がある。ヤンゴンーティラワ SEZ 間を最短距離で結ぶ Thanlyin 橋（道路・鉄道）は、片側一車線かつ重量制限が 30 トンである。このため貨物輸送車両は、Thanlyin 橋から東 6.5km に位置する Dagon 橋を経由する迂回ルートの利用を迫られる。ティラワ SEZ の整備・開業に向けては、Bago 川を渡るルートの整備・強化が進むことが重要である。

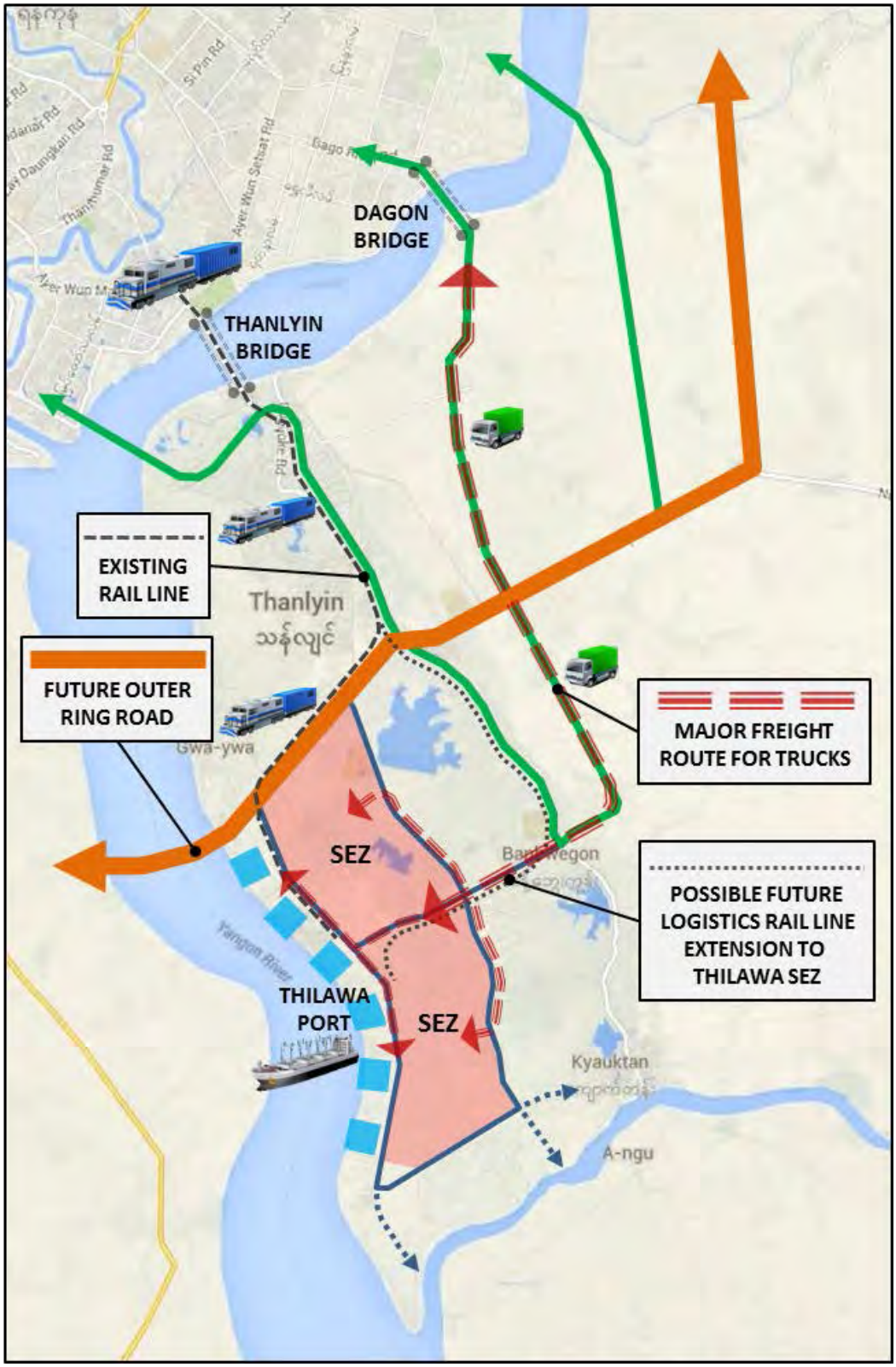
このほか、ティラワ SEZ の西側に位置し、港湾と隣接する Thilawa Seikkan Thar Road は現時点で渋滞が激しく、道路の拡張が求められる。

図 5.6.3.1 Thilawa Seikkan Thar Road の渋滞状況

（1）ティラワ SEZ への輸送ルートのコンセプト

ティラワ SEZ、港湾とヤンゴン間の貨物は、トラックによる輸送が主になると考えられる。短・中期的には、Dagon 橋を経由するルートが中心であり、長期的には、外環道の整備による道路インフラの強化が期待される。また、港湾に延びる鉄道ルートの整備がさらに進むと、SEZ、港湾、ヤンゴン間の旅客・貨物輸送が強化される。

ティラワ SEZ の輸送システムは、短・中期的にはトラックによる貨物輸送がメインであり、長期的には鉄道輸送ルートの整備が期待されるところである。

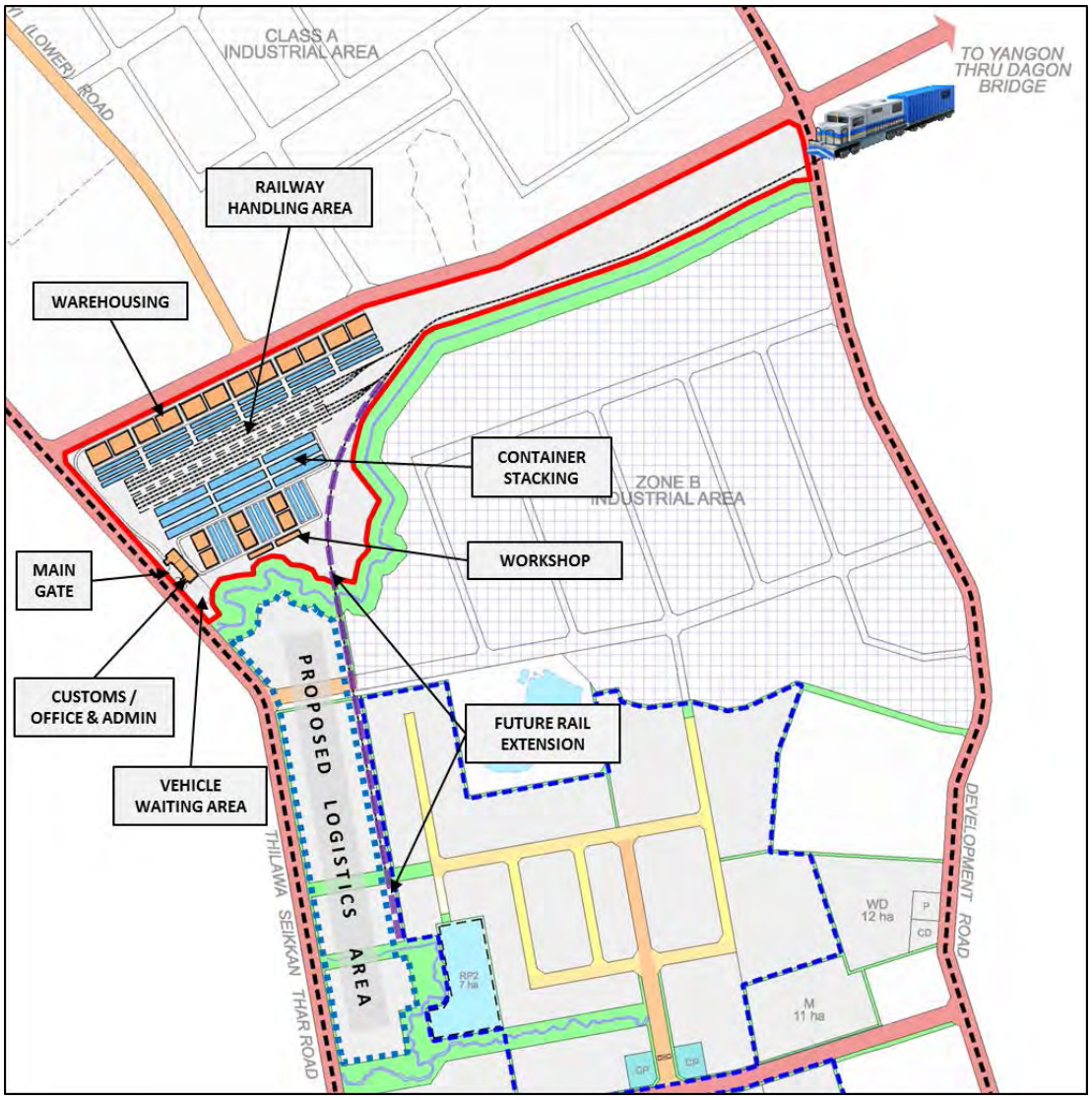


（出典）JICA 調査団

図 5.6.3.2　ティラワ SEZ への輸送ルートのコンセプト

（2）ティラワ SEZ の鉄道インフラの整備

複合用途区域・鉄道輸送施設向け保留地は、トラックによる Thilawa Seikkan Thar Road からの貨物輸送の玄関口となることを想定しつつ、鉄道貨物の荷捌き拠点、倉庫、コンテナターミナル、税関、事務所・管理所などを配置した。また、鉄道は南部の物流センターまで延伸させることも可能である。



（出典）JICA 調査団

図 5.6.3.3 ティラワ SEZ の鉄道インフラ予想図

（3）ティラワ SEZ 内の道路網

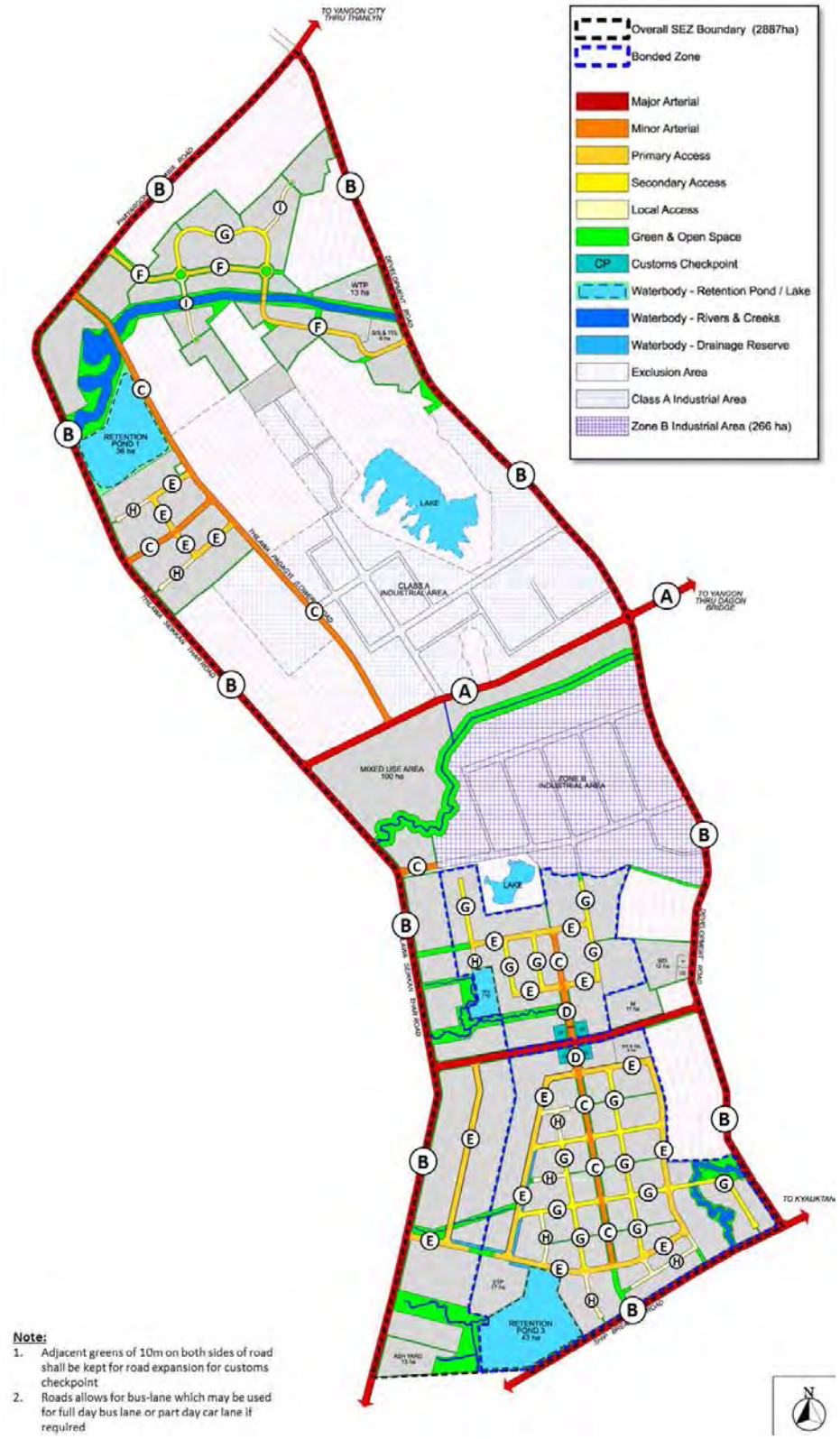
ティラワ SEZ に就業する労働者は公共交通機関、役員・管理者層は乗用車での通勤が想定されることを踏まえ、開発基本計画においては、SEZ 内の道路整備は主要幹線道路から個別区画へのアクセス道路までの 5 つのカテゴリーを想定した。全ての道路に幅 2.5m の自転車専用レーンを設けるほか、工業区域内の道路には路上駐車スペースを設定する。

表 5.6.3.1 ティラワ SEZ の道路カテゴリー

ROAD CATEGORIES	REF	TYPE	RIGHT OF WAY RESERVE (M)	LANES PER DIRECTION
Major Arterial	**A**	Dual 3 with BRT	60	3
Major Arterial	**B**	Dual 4 with Bus Lane	60	4 + Bus lane
Minor Arterial	**C**	Dual 3	47	3
Minor Arterial	**D**	Dual 3 with Bus Lane	59.4	3 + Bus lane
Primary Access	**E**	Dual 2 with Parking	46.8	2 + Parking
Primary Access	**F**	Dual 2	39.8	2
Secondary Access	**G**	Undivided 4 Lanes	35.8	2
Local Access (Industry)	**H**	Undivided 2 Lanes	31	1
Local Access (Res)	**I**	Undivided 2 lanes	28.4	1

（出典）JICA 調査団

図 5.6.3.4 ティラワ SEZ の道路イメージ（例：シンガポールのコンテナターミナルに接続する道路）



（出典）JICA 調査団

図 5.6.3.5 ティラワ SEZ 内の道路網

（4）道路拡張に備えた緑地帯の設定

開発基本計画では、保税区域ゲートに通じる道路に沿って緑地帯を設けている。これにより、ゲートの通行待ちのトラックが列をなす場合に、道路を複数レーンに拡張することが可能となる。

（出典）JICA 調査団

図 5.6.3.6 保税区域ゲートへの道路沿いに設定する緑地帯

（出典）JICA 調査団

図 5.6.3.7 保税区域ゲートイメージ

また、将来的に SEZ 内の各エリアの連結性・アクセスを改善する必要性が生じることに備え、道路の延伸・拡張のための余地として各所に緑地帯を設定した。

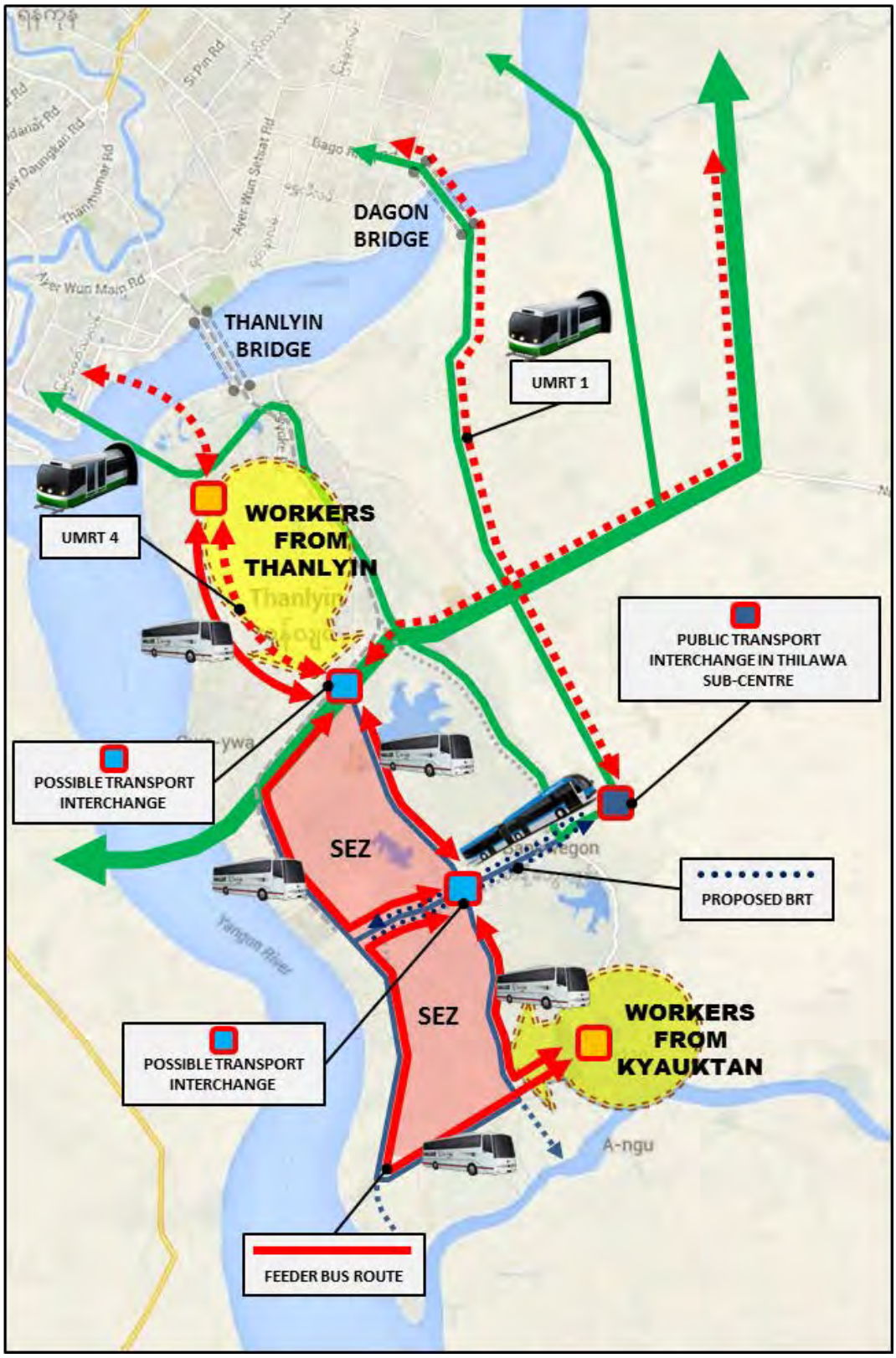
（出典）JICA 調査団

図 5.6.3.8 各エリアの連結性・アクセスの改善に備えた緑地帯の設定

（5）ティラワ SEZ への公共交通網

開発基本計画では、将来的にはティラワ SEZ に 2 路線の UMRT が接続することを想定する。UMRT1 は、ティラワサブセンターが終着駅となり、ティラワサブセンターーSEZ 間はバス高速輸送システム（Bus Rapid Transit：BRT）の運行を、また、UMRT2 はティラワ SEZ の北側に接続することを想定した。

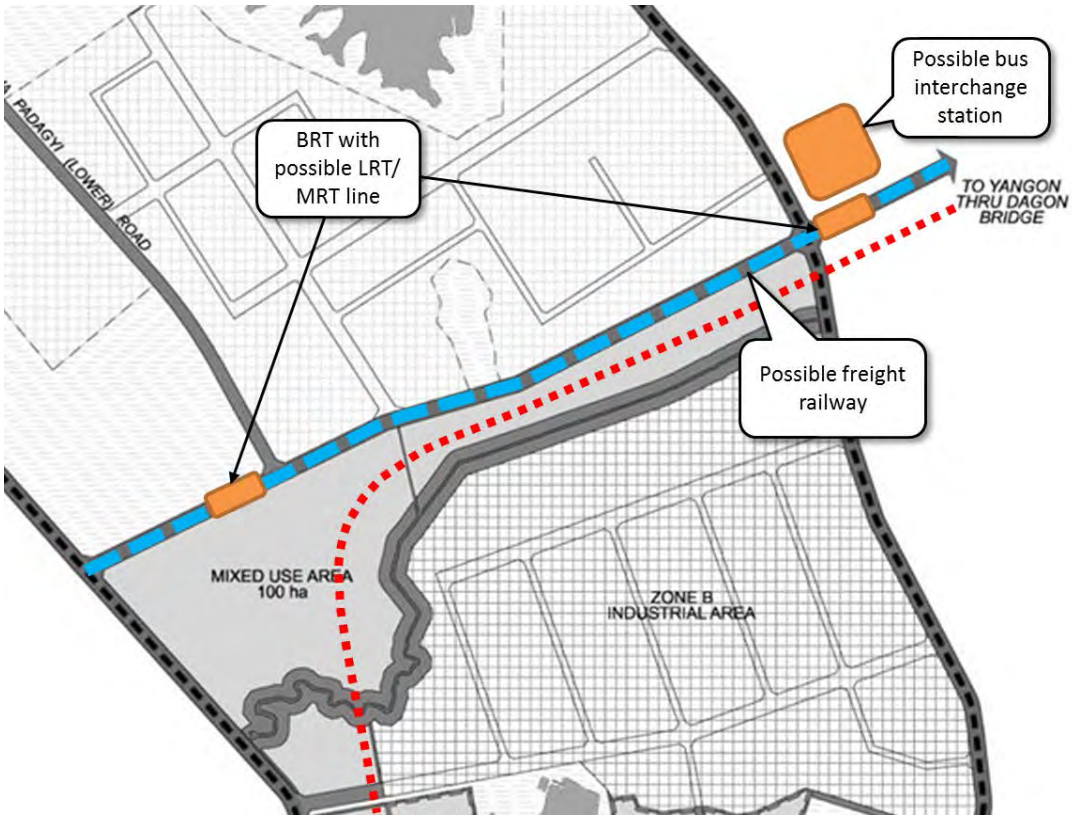
これらの UMRT が接続する駅は、SEZ 内を運行するバスをはじめとする公共交通機関の乗換拠点となると考えられる。



（出典）JICA 調査団

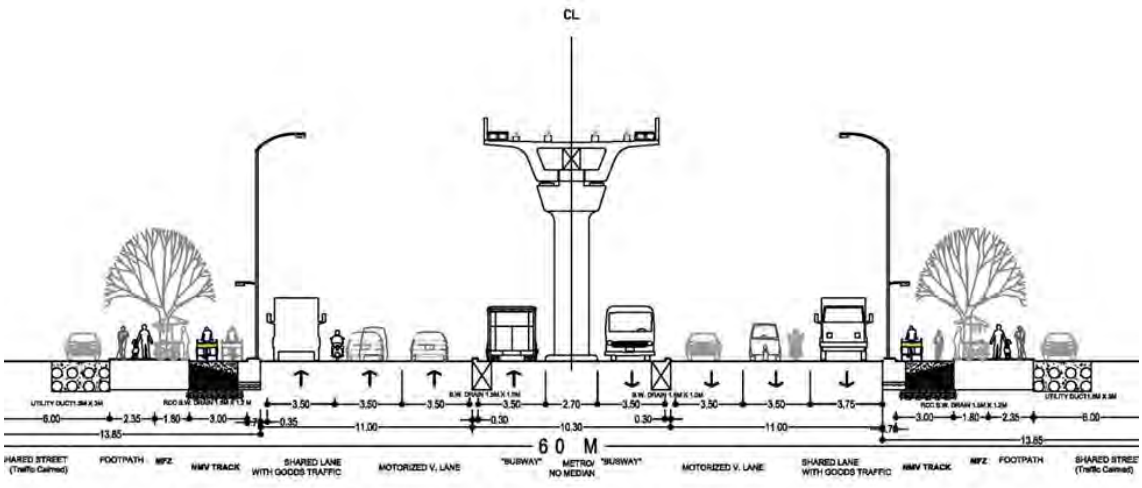
図 5.6.3.9 ティラワ SEZ への公共交通網

BRT 向け道路の専用レーンは、将来的に UMRT1 がティラワサブセンターから SEZ 内に延伸することを可能とする設計を念頭に置いている。



（出典）JICA 調査団

図 5.6.3.10　BRT の拡張



（出典）JICA 調査団

図 5.6.3.11　BRT 専用レーンを活用した LRT/MRT の導入

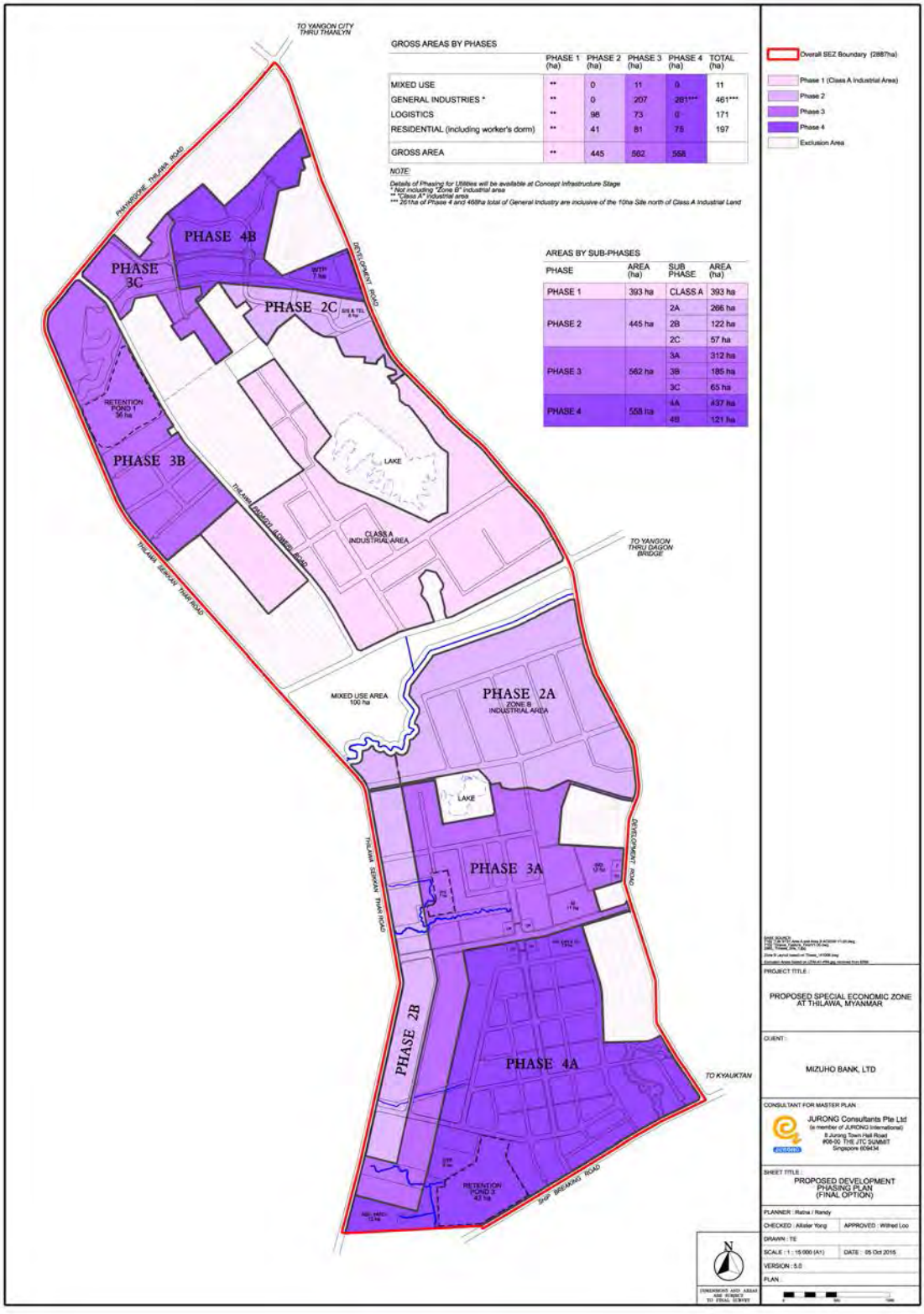
5.6.4 フェージング

広大な面積を有するティラワ SEZ の開発は、開発コストを管理する観点から、段階的に実施することが合理的である。開発基本計画では、100ha の複合用途区域・鉄道輸送施設向け保留地及び除外区域を除いたエリアについて、下表の通り 4 つのフェーズに分けて開発を進めることを提案する。

表 5.6.4.1 ティラワ SEZ 開発のフェージング

Phase	Area (ha)	Sub phase	Area (ha)
Phase 1	393	Zone A	393
Phase 2	445	2A	266
		2B	122
		2C	57
Phase 3	562	3A	312
		3B	185
		3C	65
Phase 4	558	4A	437
		4B	121

（出典）JICA 調査団



（出典）JICA 調査団

図 5.6.4.1 ティラワ SEZ 開発のフェージング

6 環境影響評価

6.1 環境影響評価業務概要

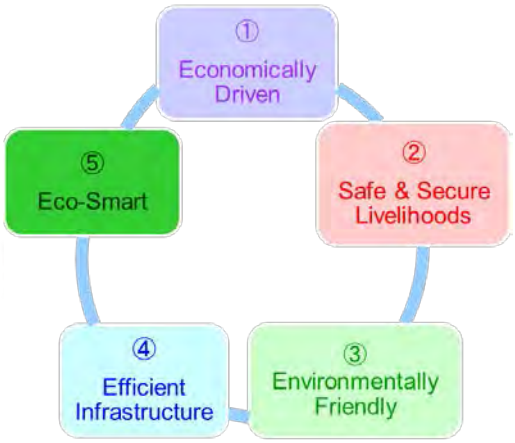
本調査における環境影響評価業務として、環境・社会状況に係るベースライン調査及び土地利用計画の策定に係る代替案検討を行った。本調査において、マスタープランレベルの計画策定が行われていないことから、一般的な SEA と異なり、環境影響評価及び緩和策の提示は行っていないが、便宜的に戦略的環境影響評価（SEA）と呼称する。

6.2 戦略的環境影響評価（SEA）の概要

JICA環境社会配慮ガイドライン(2010年4月)において、戦略的環境影響評価（SEA）とは、「事業の前の計画段階やさらにその前の政策段階など、上位段階の意思決定における環境アセスメント」と定義されている。上位段階とは、マスタープランや地域レベルの開発計画等が含まれ、SEAの実施は事業実施機関等に早期の段階から環境社会配慮における住民協議や情報公開を促すことを目的とする。ティラワ経済特別区（SEZ）整備事業（2,000ha）（「本事業」または「2,000ha」）の場合、事業実施は本SEA策定の前にミャンマー政府及び日本政府により決定されていたことから、本SEAは複数の開発シナリオを提示するためではなく、個別の事業に供するために作成された。従って、本SEAは本事業の政策レベルでの環境社会配慮に係る経緯の記録と、ステークホルダーのための参照資料として作成されたものとの位置付けである。本SEAでは、ゼロオプションに加え2つの代替案が提示されているが、環境影響評価及び緩和策の提示は含まれていない。本SEA本文は、Appendix A参照のこと。

6.2.1 事業概要

本事業は、ヤンゴンから約 20km 南東の Thanlyin タウンシップ及び Kyauktan タウンシップに位置するティラワ SEZ（総面積 2,400ha）のうち早期開発区域（Zone A、400ha）を除く 2,000ha が対象である。（下図：事業地位置図）。本事業が掲げる上位目標は「未来のミャンマーためのトリガー（trigger for the future of Myanmar)」の創設、及び国民生活の向上のための経済開発の促進である。ミャンマー政府と日本政府は本事業は外国資本参入のための環境作りと捉えており、その開発のコンセプトは下図：事業開発コンセプトに示される通りである。



（出典）経済産業省（日本）Project for Promoting Export of Infrastructure System(2013)

図 6.2.1.1 事業地位置図

図 6.2.1.2 事業開発コンセプト

6.2.2 法的及び行政的枠組み

ミャンマー国における環境保護関連法のうち最も重要な法律は環境保全法(2012 年)である。環境保全法は 14 章から構成されており、その中でミャンマー国政府は環境保護委員会を設け（第 3 章 4 条)、その元で同国の環境基本方針や他の環境方針を定めるものとしている（第 3 章 6 条)。環境基本方針を実践する各省庁も委員会で定められた環境基本方針に基づき、国或いは地域における環境計画、基準、モニタリングプログラム、環境影響評価（EIA）と社会影響評価（SIA）の承認手続き等を策定、実施する役割が定められている（第 4 章 7 条)。また、外国投資法及び施行規則(Notification No. 11/2013)には EIA/SIA について記載されており、施行規則（Notification No. 1/2013）には環境影響評価を要する事業種が記載されている。尚、同国の環境影響評価に関する政令（EIA Procedures）は、2015 年 12 月 29 日、排出ガイドラインとともに承認された。ミャンマー国の主要な環境社会関連法令を以下に示す。

表 6.2.2.1 ミャンマー国の主要な環境社会関連法令

区分	法令名（仮和名）	法令名（英名）
環境法	環境保全政策（1994 年）	Environmental Conservation Policy
	環境保全法（2012 年）	Environmental Conservation Law
	環境保全法施行細則（2014 年）	Environmental Conservation Rules
	環境影響評価手順（2015 年）	EIA Procedures
	環境影響評価ガイドライン（案）	Draft EIA Guidelines
産業法	SEZ 法（2014 年）	Myanmar Special Economic Zone Law
	外国投資法（2012 年）	Foreign Investment Law
	工場法(1951 年)	Factory Act
森林法	森林法(1992 年)	Forestry Law
生物多様性法	野生動植物保護・自然環境保全法(1994 年)	Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law
水質・河川法	水資源・河川保全法(2006 年)	Conservation of Water Resources and Rivers Law
	地下水法(1930 年)	Underground Water Act
	運河法(1905 年)	Canal Act
土地法	空地、休閑地、未開墾地管理法(2012 年)	Vacant, Fallow and Virgin Lands Management Act
	農地法(2012 年)	Farmland Law
	用地取得法（1894 年）	Land Acquisition Act
漁業法	淡水漁業法(1991 年)	Freshwater Fisheries Law
	海洋漁業法(1990 年)	Marine Fisheries Law
	養殖業法(1989 年)	Law on Aquaculture
文化遺産法	文化遺産保護法(1998 年)	Protection of Cultural Heritage Sites Law
公共衛生法	公共衛生法(1972 年)	Public Health Law
人権	ティラワ SEZ における責任を伴う投資促進に係る通知(2015 年)＊	Notice to Ensure the Responsible Investment in the Thilawa SEZ

＊「ティラワ SEZ における責任を伴う投資促進に係る通知」は法令ではない。

（出典）JICA 調査団

6.2.3 基本情報

本事業地の環境社会関連基本情報の要約は、以下の通り。

（1）汚染対策

大気質

基準値を概ね満足する。一部のモニタリングポイントで、乾季に全浮遊微粒子（TSP）と二酸化窒素（NO_2）が基準値を超える箇所が確認された。

水質

乾季の表層水について、全調査地点で砒素およびクロムが基準値を大幅に超過し、銅についても基準値を超過した。また、水銀、鉛、ニッケルについても、いくつかの地点で超過が確認された。乾季の地下水についても同様の傾向が見られ、砒素、水銀、クロム、ニッケルが超過して確認された。雨季はシアン化合物の超過が表層水で確認されたが、地下水での超過は確認されなかった。現在、対象地での生産活動は行われておらず、汚染源となるものも存在しないため、超過は自然由来によるものと考えられる。

廃棄物

本事業地全体から発生する廃棄物を処理する処理場を Zone A 内の西側に建設中である。同処理場は、産業廃棄物、有害廃棄物、及びリサイクル可能な廃棄物を取り扱う。一般廃棄物はヤンゴン市により処分される。

土壌汚染・底質

全てのモニタリング項目で基準値を満足する。基準値は超えないものの、クロム、亜鉛、カドミウムの数値はやや高い。近接するヤンゴン川の底質については、重金属（銅及びニッケル）濃度が基準値を超えることが報告されている[1]。

騒音・振動

全てのモニタリング項目で基準値を満足する。

地盤沈下

地盤沈下は記録されていない。

悪臭

悪臭の発生源は特に確認されていない。

（2）自然環境

保護区

本事業実施予定地内に保護区は存在しない。

生態系

専門家による現地調査によると、本事業実施予定地内において、91 種の鳥類、31 種の魚類、20 種の爬虫類、38 種の昆虫、71 種の樹木、9 種のマングローブが観察された。植物相のうち、IUCN レッドリストの絶滅危惧 IB 類（EN）が 1 種（Dipterocarpus alatus Roxb)、準絶滅危惧（NT）が 1 種（Dalbergia cultrata Grah)、それぞれ確認された。動物相については、IUCN レッドリストの絶滅危惧種に指定される種は確認されなかったが、準絶滅危惧（NT）に指定され

[1] 出典：“The Enhancement of the Efficient Operation of Thilawa Area Port and Logistics Depot Project”

る 1 鳥類（Ploceus hypoxanthus）及び 3 魚類（Labeo nandina、Anguilla bicolor 及び Wallago attu）が確認された。また、IUCN レッドリストとは別にミャンマー国内で保護されている固有種として、white-throated babbler（Turdoides gularis)が事業実施予定地内で観察されている。同予定地内に存在するマングローブや水辺がこれらの保護種にとって重要な住処となっている。

水象

本事業実施予定地近くの主な水流はヤンゴン川及び Hmawwun 川である。また、サイト内外の主な貯水池として、Zarmani Dam、Thilawa Dam 及び Bant Bway Kone Dam がある。また、サイト内には 6 つの小川が流れている。

地形・地質

本事業実施予定地は平均海抜 6.6m のほぼ平坦な地形である。南側は北側よりも低地である。

（3）社会環境

非自発的住民移転

別途、JICA の支援でミャンマー政府が住民移転計画を策定中である。

生活・生計

本事業実施予定地内及び周辺の住民の生計手段として、農業、工場労働、漁業などが確認されている。

少数民族・先住民族

本事業実施予定地内に少数民族・先住民族は存在しない。

土地利用・水利用

土地は主に農地として使用されている他、空き地も存在している。湖及び井戸水が飲み水などに利用されている。

既存の社会インフラ・サービス

本事業実施予定地を含むタウンシップ内には、学校（小学校、中学校、高校及び幼稚園、宗教学校（Monastery School）を含む)、クリニック、警察署が存在する。同予定地内では一部の新規道路も建設中である。事業実施予定地周辺の住民は小川の一部を使って船により移動している。

被害と便益の偏在、地域内の利害対立

湖及び小川の水利用は利害対立無く共有されている。被害と便益の偏在は特段見受けられない。

文化遺産

本事業実施予定地を含むThanlyinタウンシップ及びKyauktanタウンシップには126の仏塔（pagoda）、177の仏教寺院、5のキリスト教教会、10のモスク、2の中国系寺院が存在するものの、同予定地内には重要な文化遺産は存在しない。

景観

本事業実施予定地及びその周辺の景観構成要素として、水田、家畜、小川、寺院、湖やダム、その他小規模インフラ等があり、所謂田舎の景観を有している。尚、Zone Aの開発に伴い工場等の建設が進められており、一部区域においては景観に変化が生じつつある。

ジェンダー

ミャンマー国憲法において、全ての国民は肌の色、性別、年齢、宗教や人種によって差別されないことが謳われている。

子どもの人権

ほとんどのこどもが初等教育や宗教教育を受けることができている。

HIV/AIDS等の感染症

この地域では下痢が最もよく見られる感染症である。

交通

Thanlyin橋周辺で交通渋滞が頻発している。

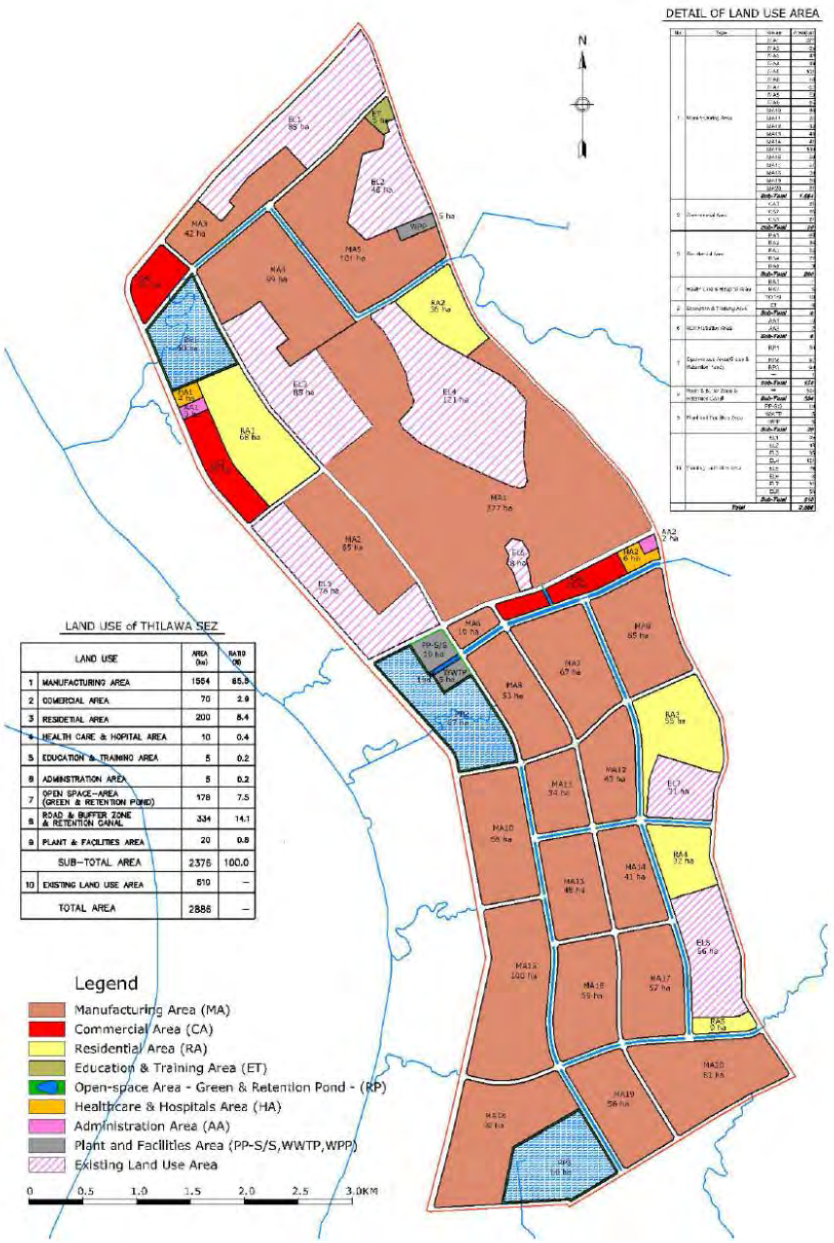
6.2.4 代替案の検討

（1）ゼロオプション

ゼロオプションとは、本事業が実施されないケースである。本事業が実施されない場合、当該2,000haのSEZとしての開発は行なわれず、環境社会状況も一定期間は変化しないことが予測される。一方、現在のミャンマー国の急速な経済発展と高まる産業育成のニーズに対応するために、同国の経済中心地であるヤンゴン近郊に位置し地理的優位性にも恵まれた当該地は、SEZとして整備されない場合であっても外国資本企業を中心とした投資家・開発業者・企業等にとって魅力的な場所であることは変わらない。結果、SEZという枠組みが無い状態で開発が進められ、当該地域における包括的な環境社会影響管理がなされない状況となる可能性がある。

（2）代替案 1（オリジナルプラン）

代替案 1 は、経済産業省調査（2013 年）により提案され、ミャンマー国及び日本の政府間によって承認された案である。代替案 1 の土地利用計画を下図に示す。

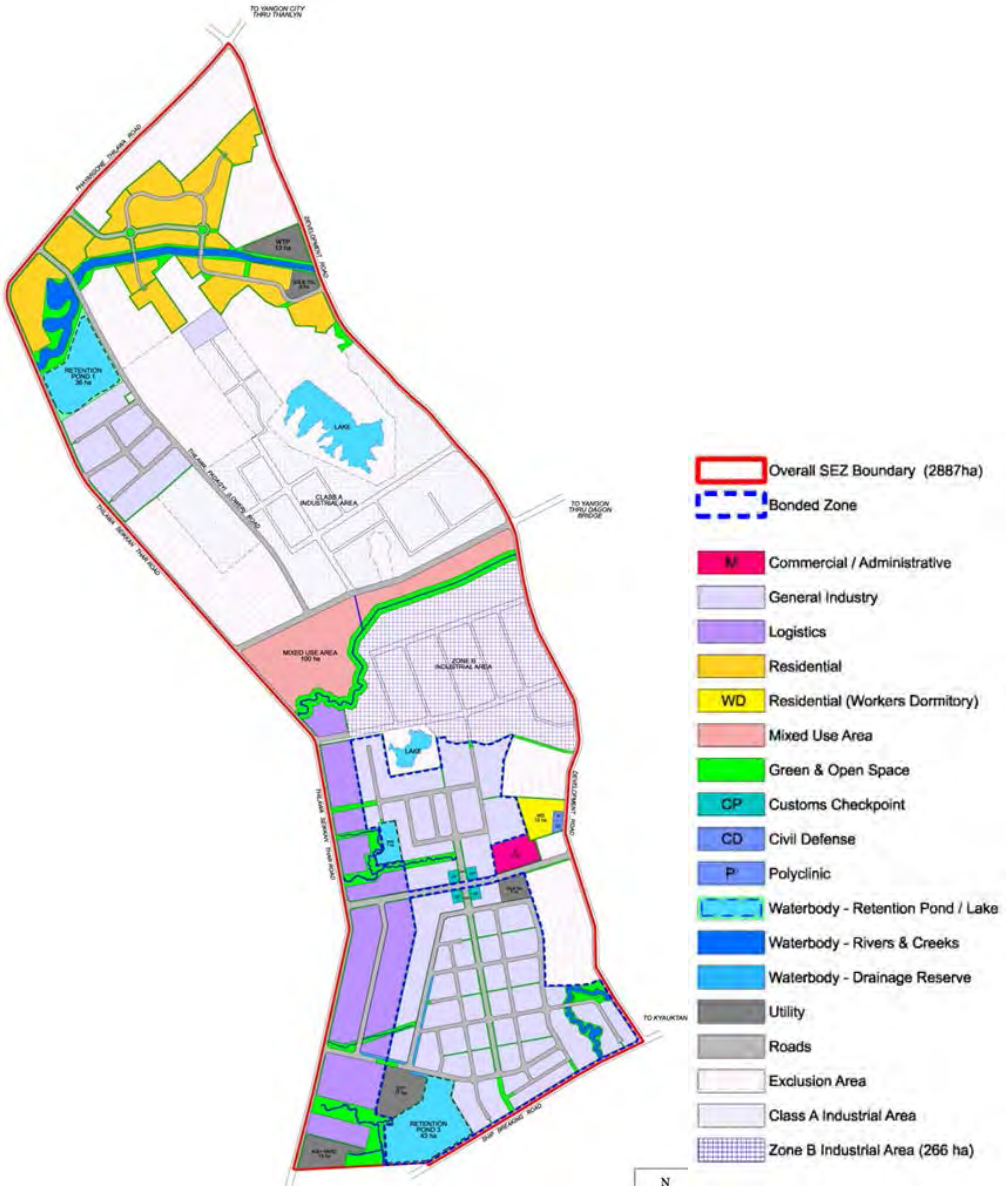


（出典）経済産業省（日本）Project for Promoting Export of Infrastructure System(2013)

図 6.2.4.1 代替案 1 土地利用計画

（3）代替案 2（更新プラン）

代替案 2 は、除外エリアやステークホルダー協議結果等を踏まえ、より既存の自然環境や社会環境を考慮したものとなっている。代替案 2 の土地利用計画を下図に示す。



（出典）JICA 調査団

図 6.2.4.2 代替案 2 土地利用計画

（4）代替案比較検討

上記の代替案 1 及び 2 を比較した表を以下に示す。比較検討の結果、本事業の非商業的利益に鑑み、代替案 2 がより望ましい計画であると判断される。

表 6.2.4.1 代替案比較

項目		代替案 1 （オリジナルプラン）		代替案 2 （更新プラン）	
土地利用計画	**総面積**	**2,886ha**	**100.0%**	**2,887ha**	**100.0%**
	一般工業地区	1,554ha	53.8%	1,119ha	38.8%
	ロジスティクス地区	0ha	0.0%	170ha	5.9%
	住宅地区	200ha	6.9%	191ha	6.6%
	商業/行政地区	75ha	2.6%	11ha	0.4%
	混合利用地区	0ha	0.0%	100ha	3.5%
	道路	334ha	11.6%	261ha	9.0%
	緑地、池	178ha	6.2%	301ha	10.4%
	公共施設	20ha	0.7%	54ha	1.9%
	その他	15ha	0.5%	13ha	0.5%
	除外エリア	510ha	17.7%	767ha	23.1%
計画段階における対策（2014 年 4 月時点）		［政策レベル］ -環境に優しい -エコ・スマート ［土地利用計画における配慮］ -雨水貯水池 -汚水処理施設		［政策レベル（ドラフト）］ -環境に優しい -エコ・スマート ［土地利用計画における配慮］ -雨水貯水池 -小川 -表層水（池） -緑樹 -汚水処理施設 -文化遺産	
汚染対策					
大気質、騒音、振動、悪臭、土壌		何らかの影響が想定されるものの、ワンストップサービスセンターの監理のもと各テナントにより必要な対策がとられる。			
水質		汚水は汚水処理施設にて処理される。			
地盤沈下		本事業供用後に公共供給水として地下水を利用することは想定していないが、工事中・供用後ともに何らかの目的で地下水が使われる可能性がある。			
自然環境					
保護区		本事業実施予定地内に保護区は存在しない。			
生態系		マングローブに負の影響を及ぼす可能性がある。		マングローブは保全される。事業地中心部に位置する修道院に隣接する池は保全される。	
水象（洪水対策）		3 箇所の雨水貯水池が整備される。メインの小川がコンクリート造りの水路に改変される。		3 箇所の雨水貯水池が整備される。メインの小川は現在の流形を保ちつつ、流水量を確保するために拡張される。	

地形・地質	本事業実施予定地は、特徴的な地質を有しない、概ね平坦な地形である。	
社会環境		
住民移転	本事業実施予定地内に居住する人々がおり、移転が必要である。	
生計	本事業実施予定地内外に、小売や商業、農業、工場労働、漁業等に従事している人々がいる。	
文化遺産	文化遺産に負の影響を及ぼす可能性がある。	法令に則り、文化遺産は保護される。
少数民族、先住民族	本事業実施予定地内に少数民族、先住民族は存在しない。	

（出典）JICA 調査団

6.2.5 住民協議

（1）第 1 回目ステークホルダー協議

本事業の SEA に係る第 1 回目のステークホルダー協議は、2014 年 6 月 30 日に TSEZMC の仮事務所にて開催され、政府関係者、地元住民、メディアや NGO 等計 453 名が出席した。事前に新聞や招待状、General Administration Department (GAD)を通じて開催通知がなされ、遠方からの参加者のために当日の開催場所までは輸送サービスが提供された。協議は基本的にミャンマー語で行なわれた。TSEZMC の代表による冒頭挨拶のあと、事業や EIA プロセス等についての発表があり、その後質疑応答として参加者からのコメントが寄せられた。本協議時に寄せられた主なコメント及び TSEZMC 等からの回答要旨は以下の通りである。

表 6.2.5.1 第 1 回 SEA ステークホルダー協議時のコメント及び回答要旨

分類	コメント	発言者	TSEZMC (MC)、ECD等による回答
汚染対策等	・EIAとSEAの違い ・SEZ内から発生する大気汚染物質や水質汚染物質が基準値を超えた場合の方策	Alwan Sut Village, Thilawa Social Development Group	・2,000haのEIAとSEAの違いについて説明。本SEAの第2章にSEAに含めるべき内容を記載。 ・汚水処理方法について説明。本SEAに説明を追記。
地域住民の健康	・被影響住民への健康サービス計画	Thida Myaing village	・完工後の健康問題対策について国際HIV/AIDSアライアンスの感染症専門家と協議する。本SEA4.1.3.にあるようにこの地域では多くの医療機関がある。これらの収容人数等についてはEIAで詳細に調査する。
生態系	・湿地テクノロジーを利用するべき ・環境管理計画に生態系管理計画も入れるべき	Myanmar Bird and Nature Society	・現存する小川は保全される。拡張が必要な場合にはできる限りマングローブの生息域を保護する方法を検討する。

			・EIAの環境管理計画に生態系に対する保全措置やモニタリングを含む。
地域計画、雇用機会	・マルチモーダル交通システムが地域には必要 ・SEZ内における地域住民の雇用機会について質問	Myanmar Maritime University	・本事業は域内で実施中の多くのプロジェクトの一つであり、ヤンゴン交通マスタープランの一部となる。本SEAに関連事項追記。 ・雇用についてはTSEZMCが別の調査においてベースラインデータを収集しており、結果はEIAの社会環境セクションに含まれる予定。
情報公開、住民参加	・環境当局への提出と同タイミングで住民に調査報告書を公開してほしい ・報告書が事実に即しているとどのように判断すれば良いのか。国際基準に準じて報告書が作成されるべく、住民も調査やモニタリングに参加すべき	Shwe Pyouk Village/ Alwan Sut Village, Thilawa Social Development Group	・環境当局への最終報告書提出と、(インターネットやGADでの) 一般公開は同じタイミングである。 ・すでにボーリング調査実施前に住民と協議する等して調査への住民理解を得ながら進めている。調査期間中の住民の方々からの意見を歓迎する。
生態系、生活・生計	・SEZ内を流れる6つの小川の流形への影響を懸念、適切な管理を望む ・住民の多くは貧しく教育レベルも低いため、訓練機会の提供を望む	Yangon regional parliament	・最終的な土地利用計画では、6つの小川は基本的に現状のまま保全され、拡張する場合でも自然に優しい手法がとられる。 ・TSEZMCとしては、SEZ内に入居する企業のうち地元の雇用機会の増加に貢献する企業を優先的に選択。また、職業訓練も提供する予定。
適用基準	・国際基準とは何か	Thida Myaing village	・国際基準としてIFCガイドラインが適用された。詳細は本SEAを参照。
住民移転	・非自発的住民移転の対象となる住民へは国際基準に則った補償等を提供することを望む	Save the Children NGO	・SEAでは住民移転調査は実施しないが、本SEA1.3にあるように基本的スタンスとしては国際基準を採用する。

（出典）JICA 調査団

（2）第 2 回目ステークホルダー協議

本事業の SEA に係る第 2 回目のステークホルダー協議は、2015 年 8 月 26 日に TSEZMC の仮事務所にて開催され、政府関係者、地元住民、メディアや NGO 等計 303 名が出席した。事前に新聞や招待状、General Administration Department (GAD)を通じて開催通知がなされ、遠方か

らの参加者のために当日の開催場所までは輸送サービスが提供された。協議は基本的にミャンマー語で行なわれた。TSEZMC の代表による冒頭挨拶のあと、SEA 調査結果についての発表があり、その後質疑応答として参加者からのコメントが寄せられた。本協議時に寄せられた主なコメント及び TSEZMC 等からの回答要旨は以下の通りである。

表 6.2.5.2 第 2 回 SEA ステークホルダー協議時のコメント及び回答要旨

分類	コメント	発言者	TSEZMC（MC）、ECD等による回答
調査対象	自分は調査対象者のはず。再確認してほしい。	Alwan Sut Village住民	再確認する。
ステークホルダー協議	ステークホルダー協議開催通知を一週間早くするべき。	Alwan Sut Village住民	
Zone A	Zone Aの廃棄物管理に懸念がある。	Alwan Sut Village住民	人口増加対応に必要な施設が建設される。また、境界には警備員を配置する。
環境影響	環境影響の緩和方法、及び各工場に許される影響制限値	Community Relationship Officer, MJTD	ビジネスにもよる。TSEZMCは各工場が本SEZの基準に適合しているかを確認し、適合していない場合には罰則または勧告を行う。

（出典）JICA 調査団

上記のステークホルダー協議の他に、本調査期間中、NGO や民間企業、関係政府機関など多くのステークホルダーとの協議（preliminary / initial meetings）を実施し、SEA 実施のための情報提供や各種コメント等を頂いている。

The Republic of the Union of Myanmar

Preparatory Survey on Thilawa SEZ Development Project (2,000 ha)

Strategic Environmental Assessment (SEA)

January 2016

Thilawa SEZ Management Committee

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Acronyms

Acronym	Definition
ASEAN	Association of Southeast Asian Nations
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
ECR	Environmental Conservation Rules
ECL	Environmental Conservation Law
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESC	Environmental and Social Considerations
HIV/AIDS	Human immunodeficiency virus / acquired immunodeficiency syndrome
IFC	International Finance Corporation
JICA	Japan International Cooperation Agency
MOAI	Ministry of Agriculture and Irrigation (Myanmar)
MOC	Ministry of Construction (Myanmar)
MDA	Ministry of Development Affairs (Myanmar)
METI	Ministry of Economy, Trade, and Industry (Japan)
MOECAF	Ministry of Environmental Conservation and Forestry (Myanmar)
MOI	Ministry of Industry (Myanmar)
MOST	Ministry of Science and Technology (Myanmar)
NGO	Non-Governmental Organization
SEA	Strategic Environmental Assessment
SEZ	Special Economic Zone
STD	sexually transmitted disease
TSP	Total Suspended Particles
USEPA	United States Environmental Protection Agency
WHO	World Health Organization
YCDC	Yangon City Development Committee

1 Introduction

1.1 Project Background

Thilawa Special Economic Zone (SEZ) Development Project (2,000ha) ("the Project" or "2,000ha area") is the second Phase of a two-phase SEZ of an area of 2,400ha located about 20km southeast of Yangon in the Townships of Thanlyin and Kyauktan.[1]

Figure 1-1 shows the details of the Thilawa SEZ location relative to the greater Yangon City area. The area was selected due to several factors including but not limited to availability of a workforce, pre-existing industrial activity, proximity to a seaport, and easy road access into Yangon. The area has been planned for development by the Myanmar Government since 1997 but has not been developed for industrial use in a planned manner to date.

Source: Ministry of Economy, Trade, and Industry (METI) (2013) *Project for Promoting Export of Infrastructure System*

Figure 1-1 Location of Thilawa SEZ

1.2 Project Proponent Description

Currently the Project Proponent for the Thilawa SEZ Development Project (2,000 ha) is the Thilawa SEZ Management Committee. The Project Proponent may be changed in the future to a consortium of public-private sector companies that would invest in the Project development.

1.3 Application of International and Domestic Guidelines

The Project will apply international guidelines for development of the present SEA and the eventual EIA. The guidelines followed will be reflective of domestic guidelines such as the Environmental Impact Assessment Rules of the Government of the Union of Myanmar, which may include such guidelines as World Bank Safeguard Policies, IFC Performance

[1] Source: Ministry of Economy, Trade, and Industry (METI) (2013) Project for Promoting Export of Infrastructure System

Standards and JICA's Guidelines for Environmental and Social Considerations (April 2010) (hereinafter "the JICA Environmental Guidelines").

The domestic guidelines do not specify particular methods or requirements for an SEA. However, international best practice entails the preparation of an SEA developing a sectoral or regional cooperation program. Such standards apply an SEA when the preparatory surveys include not only project-level but also upper-stream-level studies, or Master Plan Studies. Since this present project is reflective of such a regional-level programmatic project, an SEA was developed. For instance, proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. According to the JICA Environmental Guidelines, category A projects require more diligence and planning, which include information disclosure, stakeholder meetings based on stakeholder analysis, alternative scenario analyses and so on. By involving stakeholders at the early stage of the project, the SEA helps identify possible constraints and mitigation measures to be incorporated into the project as environmental and social considerations.

1.4 Thilawa SEZ Objectives

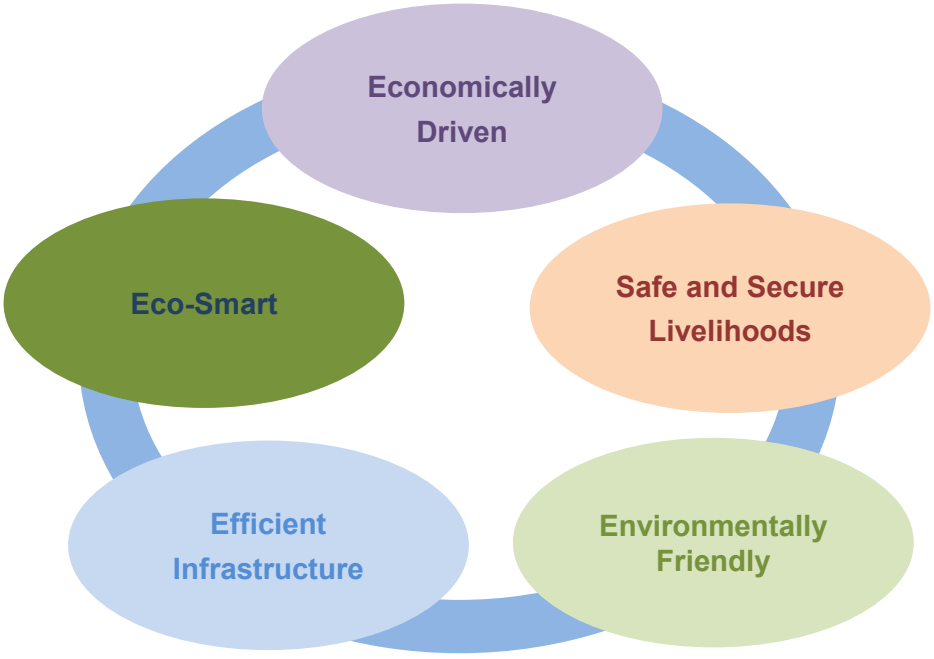
The land use plan for the entire development area of Thilawa SEZ has been examined based on the development concept and development framework defined in a previous strategic study approved at the Presidential level in Myanmar, "Project for Promoting Export of Infrastructure System". The development area is classified into Zone A (400ha) and a 2000ha area that will be further subdivided into different development phases that are not yet confirmed. These areas differ in development priority. The Zone A area being developed since 2013, before the Phase 2 area. Together those development areas are known as the Thilawa SEZ.

The high-level strategic objective for the Thilawa SEZ is to develop a "trigger for the future of Myanmar" and enhance the economic development of the country to contribute to the improvement of citizens' livelihoods. The governments of Myanmar and Japan have positioned the Thilawa SEZ project to help rapidly develop Myanmar by providing an environment for foreign investment.

The Thilawa SEZ is located close to Yangon City and therefore has a high potential for rapid growth and development given the abundant labor force in Myanmar's most populated area. Specific to the present document, in order to realize this growth in a healthy and sustainable way, it was agreed that the Thilawa SEZ should be promoted as a development project that is environmentally friendly.

Upon realizing these goals, it has been expected that the Thilawa SEZ will be more than just a manufacturing base and also serve as a leading model city for Myanmar as a whole.

The figure below presents the development concept diagram encompassing the five-pillared development strategy: Economically Driven, Safe and Secure Livelihoods, Environmentally Friendly, Efficient Infrastructure, and Eco-Smart.



Source: Ministry of Economy, Trade, and Industry (METI) (2013) *Project for Promoting Export of Infrastructure System*

Figure 2-1 Thilawa SEZ Development Concept

1.5 Potential Industrial Sectors

According to the survey conducted as a part of this project, the following markets are expected to grow in Myanmar in the near future considering the regional context. These industries will provide demand within the 2,000ha area. At present, significant demand in the Food and Beverage, Textiles, and Construction Material industries already exists, while demand in the Wood and Related Products, Machinery and Equipment, Electrical and Electronics, and Automotive Manufacturing industries will emerge in the near term.

1.6 Official Thilawa SEZ Designated Area and Exclusions

According to Government Notification (No. 65/2013), the Thilawa SEZ boundaries consist of

an area of 23.422148442 km^2 (5,787.718 acres) in the Southern District of Yangon Region, the boundaries of which are defined[2] as:

North: From the survey point-123 (N: 1847877.521, E: 205796.949) at the junction of the Phayargon-Thilawa Road and Thilawa Terminal Road, along with the boundary points of the west and north of the Phayargon-Thilawa Road, to the survey point-096 (N: 1850284.407, E: 207954.516) at the junction of Phayargone-Thilawa Road and Development Road, which is approximately 3.2 km away in north-eastern side.

East: From the survey point-096 at the junction of Phayargone-Thilawa Road and Development Road, along with the boundary posts installed at the eastern side of the Development Road, to the survey point-001(N: 1840511.149, E: 212015.422) at the junction of Development Road and Shipwreck Factory Road, which is approximately 10.6 km away in the south.

South: From the survey point-001at the junction of Development Road and Shipwreck Factory Road, along with the boundary posts installed at the southern side of the Shipwreck Factory Road, to the survey point-164 (N: 1839299.835, E: 209914.662) at the southern side of the Shipwreck Factory Road, which is approximately 2.4 km away, and continuously up to the survey point-163 (N: 1839326.265, E: 209898.928) at the northern side of the Shipwreck Factory Road, and from that point, along with the boundary posts installed to the western side, to the survey point-159 (N: 1839265.381, E: 208591.603) at the corner of Thilawa Terminal Road, which is approximately 1.3 km away.

West: From the survey point-159 at the corner of Thilawa Terminal Road, along with the boundary posts installed at the western side of Thilawa Terminal Road, to the survey point-123 at the junction of Thilawa Terminal Road and Phayargon-Thilawa Road, which is approximately 9.1 km away in the north.

In principal existing buildings and the associated infrastructure will be excluded from the zone. Specifically, an area with the cumulative equivalency of 1,345.644 acres is to be excluded (Government Notification No. 65/2013). The precise surveyed locations of these existing infrastructures are unknown and further studies are ongoing. The details of the exclusions are as follows:

[2] Coordinate System mentioned at the above survey points is the World Geodetic System 1984 (WGS 84).

Table 1-1 Exclusions for Existing Land Use Areas

Name	Area (acres)	Area (m2)
Myanmar Economic Cooperation glass factory and Ministry of Industry flask factory	237.515	961,189
Ministry of Industry power distribution plant	2.098	8,490
Area appropriated for the factory construction by Ministry of Industry	38.033	153,914
Myanmar Economic Cooperation's galvanized iron sheet factory and shoe factory	104.451	422,698
Ministry of Industry packaging factory and garment factories	204.608	828,019
Thilawa Dam	389.220	1,575,118
Maritime University	110.819	448,468
Hostel of Maritime University	2.033	8,227
Ayemyathida Ward	83.058	336,124
Shwepyitharyar Ward	145.361	588,255
Phanchat Monastery	4.918	19,902
Phalankanoo Monastery	2.697	10,914
Phalanywaroo Pahayalay Monastery	2.600	10,521
Thilawa Konetan Monastery	16.432	66,498
Church	0.741	2,998
Hindi Temple	1.060	4,289
Total	**1,345.644**	**5,445,632**

Source: The Republic of the Union of Myanmar. Union Government Notification (No. 65/2013). 4th Waning of Tawthalin 1375 ME (23rd September, 2013)

The pond near the Phalankanoo Monastery in the middle of the SEZ will also be voluntarily excluded in order to maintain green area in the SEZ keeping with the strategy of an environmentally friendly SEZ.

2 Strategic Environmental Assessment (SEA) Approach

International practice suggests that an SEA is conducted when Policy, Plan or Program is to be established. This may include Master Plan Studies or studies that have a regional-level impact, and the SEA is meant to encourage project proponents and related entities to ensure public participation and information disclosure in its environmental and social considerations from an early stage. In the present project, the Thilawa SEZ implementation has already been decided between the governments of Japan and the Republic of the Union of Myanmar. Therefore this SEA is not meant to be a document that propose multiple development scenarios, but that serves for this specific project. This document is meant to record the history of strategic and policy-level environmental and social considerations for the Project and serve as a stakeholder reference document. In the present SEA, 2 different alternatives plus a “without project” alternative are presented (Section 4). A separate Environmental Impact Assessment (EIA) document will be created following the SEA process in order to deeply analyze the quantitative and qualitative impacts of the project. The remainder of this chapter focuses on the structure of the present SEA.

2.1 Scoping

The SEA first and foremost is meant to delineate the impact of the project to serve as a base for further analytical work. This step, scoping, involved examining the socio-environmental aspects of the area in and around the Thilawa SEZ. The scope of consideration is generally delimitated to that area to which the project has a direct impact.

Scoping involved setting an environmental baseline condition—i.e., the present socio-environmental context of the Thilawa area—as well as identifying anticipated environmental problems and setting environmental objectives and standards for the Project development.

2.2 Stakeholder Meetings

The Project will be an integral part of the Thanlyin and Kyauktan townships as well as the greater Yangon area in the future. Therefore it is paramount that stakeholders have a voice in how environmental problems are identified and addressed. Stakeholder meetings were an important part of the SEA process to thoroughly identify environmental problems, identify mitigation measures for adverse impacts, and assign responsibility for implementation of mitigation measures where appropriate.

3 Environmental Laws, Regulations, and Policies in Myanmar

The following provides an abridged version of laws and policies in Myanmar relevant to the Project. Only elements of these laws that are specifically relevant to social and environmental aspects of the Project are summarized below.

3.1 Environmental Framework Legislation

Environmental Conservation Policy (1994)

This is a policy level document promulgated under Notification No. 26/94 dated 5 December 1994 proclaiming a policy to mainstream environmental considerations into natural resource development.

Environmental Conservation Law (2012)

The updated Environmental Conservation Law (ECL) was passed on 30 March 2012 prepared by MOECAF. The Environmental Conservation Law contains 14 chapters that define the rights and responsibilities of MOECAF, environmental standards, environmental conservation, management in urban areas, conservation of natural and cultural resources, process for businesses to apply for permission to engage in an enterprise that has the potential to damage the environment, prohibitions, offenses and punishments. In particular, Article 16 in the law stipulates responsibilities of business owners of industrial estate or business in the Special Economic Zone on environmental conservation.

Environmental Conservation Rules (2014)

The Environmental Conservation Rules (ECRs) are the detailed regulations set to implement the Environmental Conservation Law and highlight the creation of an EIA system as well as pollution prevention measures. The ECRs passed through parliament in August 2014. ECRs stipulate basic policy and concept on EIA application of the development of Projects (Article 55). In this connection, the Project Proponent shall adhere to the following policies based on ECL and ECRs:

- To have responsible to carry out by contributing the stipulated cash or kind in the relevant combined scheme for the environmental conservation including the management and treatment of waste including liquid, emission, solid (Article 16 (a) in ECL);
- To contribute the stipulated users charges or management fees for the environmental conservation Zone (Article 16 (b) in ECL)
- To comply with the directives issued for environmental conservation Zone (Article 16 (c) in ECL)

- To prepare the environment impact assessment report including EMP and submit to the Ministry (Article 55 (a) in ECRs); and
- To implement and carry out environmental management plan within the time stipulated by the Ministry and submit the performance situation to the Ministry (Article 55 (b) in ECRs).

EIA Procedures (2015) and Emission Guidelines(2015)

These procedures stipulate the procedures for completing an EIA in Myanmar including project categorization, responsibilities of project developers, responsibilities of ministries, procedures for EIA creation, and procedures for EIA review, among other issues. The procedures and Emission Guidelines are approved by ECD in December 2015.

Draft EIA Guidelines (draft stage)

The EIA Guidelines outline the expectations for creating the required environmental assessment documents under the laws of Myanmar. They provide a minimum requirement and a common framework for Project Proposal, Scoping Report and TOR, IEE, /EIA and EMP reporting, to present Project Proponents and their environmental consultants with clear the guidance on structure, content and scope of IEE/EIA reports and to ensure that IEE/EIA reporting is consistent with legal requirements, good practices and professional standards. There is currently no clear schedule regarding the drafting of the EIA Guidelines.

3.2 Industrial Law

Myanmar Special Economic Zone Law (2014)

The 2014 Myanmar SEZ Law rescinds and replaces the 2011 Myanmar SEZ law. This law provides the basis for the government's establishment of SEZs and is meant to "invigorate foreign investment into the country while safeguarding Myanmar's own interests". The law has provisions for: aligning SEZ development with national economic development plans, aligning SEZs towards the economic benefit of Myanmar, promoting balanced development, promoting international cooperation, encouraging international and domestic investors through good infrastructure, and encouraging industrial clusters. The law implements these objectives through several incentives such as providing an institutional structure for the operation of the law that includes such provisions as tax incentives and company forming procedures that are attractive to investors. Article 35 of this Law stipulates that investors shall abide by the environmental standards in the Myanmar Environmental Conservation Law, other existing laws and international standards.

Foreign Investment Law (2012)

The Foreign Investment Law is set up to delineate the statutory characteristics of investment into Myanmar. Specific to environmental aspects of the Project, there are specific requirements in the law that stipulates the protection of the environment. Furthermore, the

following types of investments are restricted or prohibited under the law:

- Business which can affect the traditional culture and customs of the national races within the Union;
- Businesses which can affect public health;
- Businesses which can cause damage to the natural environment and ecosystem;
- Businesses which can bring hazardous or poisonous wastes into the Union;
- Factories which produce or businesses which use hazardous chemicals under international agreements;

The law also sets out the powers of the Myanmar Investment Commission. This Commission is to permit investments including such aspects as changing elevation or topography of the land and approving types of business. EIA is required under this law when conducting an activity categorized as requiring an EIA under the EIA Procedures. This law is not directly applicable to the Thilawa SEZ as the Thilawa SEZ falls under the remit of the Myanmar Special Economic Zone Law. However, there are several efforts underway to harmonize industrial development with the institutional structures of the two laws.

Factory Act (1951)

The Factory Act is concerned with the operation of factories and specifically addresses labor issues and environmental pollution as regards hazardous chemicals, effluents, and others.

3.3 Forestry Law

Forestry Law (1992)

This law is implemented to promulgate forestry and related environmental policies in Myanmar. The law stipulates the legal framework for the prevention of destruction of forest and biodiversity and conservation of natural forests. The State, having been empowered by the Forest law 1992, declared all mangrove forests as protected areas[3]. Fishing within three hundred yards around mangrove areas is strictly prohibited. In order to ensure the sustainable development of aquaculture techniques and to promote mangrove-friendly aquaculture practices strict guidelines were laid down by the Department of Fisheries.

3.4 Biodiversity Law

Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law (1994)

This law is under the jurisdiction of the Ministry of Environmental Conservation and Forestry. The law provides a framework for the protection of natural habitats and ecosystems as well

[3] The areas with mangroves in the present project are not considered to be mangrove forests by the Forest Department. Therefore, in practice only these designated areas are actively protected.

as wild plants and wild animals. It also establishes responsibility for protection of wild species with MOECAF. Any damage occurring to wild species will have to be permitted through MOECAF.

3.5 Water and Rivers Law

Conservation of Water Resources and Rivers Law (2006)

The aims of this law are: (a) to conserve and protect the water resources and rivers system for beneficial utilization of the public; (b) to enable smooth and safe waterways navigation along rivers and creeks; (c) to contribute to the development of State economy through improving water resources and river system; (d) to protect environmental impact. However, this law is under the jurisdiction of the Ministry of Transport, not the Ministry of Environmental Conservation and Forestry. This law puts its strength on transportation safety and its development. Also, it is lacking in actual numerical criterion concerning the natural environment.

Underground Water Act (1930)

This act deals with the conservation and protection of underground sources of water in Myanmar.

Canal Act (1905)

This law regulates the application of water for public purposes, the supply of water, and drainage works.

3.6 Land Law

Vacant, Fallow and Virgin Lands Management Act(2012)

This act stipulates the legal framework for persons or investors seeking to develop vacant land and prescribes processes for the applicant and the government to interface with one another. The act also specifies taxes, legal action, and protection and assistance for the persons that have been granted a license to operate on such land.

Farmland Law (2012)

This law establishes the rights of citizens to farmland and provides for a permitting (“Land Use Certificate”) system for the right to the land. The law provides that the Central Farmland Management Body must coordinate to arrange for compensation and indemnity in the case of repossession of farmland in the interest of the state or in the interest of the public. Confiscated farms are to be compensated without any loss. Moreover, if a farm is upgraded with a building, compensation for such buildings must also be provided.

Land Acquisition Act (1894)

The Act enables the State and companies to compulsorily acquire land where the State and companies assert that that such land is needed for 'public purposes.' The Act outlines relevant procedures, including notice periods, procedures for obligations to acquisition (Art 5), the method of valuation of land, the process for taking possession of land (Arts16 and 17), court processes and appeals (Arts 18 and 24), procedures for the temporary occupation of land (Art 35) and the acquisition of land for companies (Art 38). The Act requires that compensation 'at market value' is provided to those from whom land is acquired (Art 23).

3.7 Fishery Law

Freshwater Fisheries Law (1991)

This law is meant to establish the laws over designated freshwater fisheries. There are prohibitions in the law that prohibit cutting undergrowth or setting fire to a fish habitat and impairing the natural condition of the fishery so as to disrupt water flow to a main fishery. Moreover, there are prohibitions on polluting water in freshwater fisheries waters and/or altering the quality of water, volume of water or the water course of fisheries and contiguous water courses.

Marine Fisheries Law (1990)

The Marine Fisheries Law determines the areas determined to be marine fisheries and sets out the licensing requirements of these fisheries.

Law on Aquaculture (1989)

This law presents provisions for the operation and licensing of aquaculture facilities in Myanmar including provisions for wastewater treatment.

3.8 Cultural Heritage Law

Protection of Cultural Heritage Sites Law (1998)

The objectives of this law are to preserve and implement a conservation policy for cultural heritage (ancient monuments and ancient sites that have historical, cultural, artistic, or anthropological value). This law specifically prohibits destruction, construction, excavation, or destruction of cultural heritage.

3.9 Public Health Law

Public Health Law (1972)

This law provides the statutory structure for the protection of people's health by controlling the quality and cleanliness of food, drugs, environmental sanitation, epidemic diseases and regulation of private clinics.

3.10 Human Rights

Notice to Ensure the Responsible Investment in the Thilawa SEZ (2015)

Thilawa SEZ Management Committee issued the Notice to Ensure the Responsible Investment in the Thilawa SEZ (Notice 04/2015) in August 2015 as a general guidance. This guidance is provided for all companies investing and doing business in the Thilawa SEZ. This general guidance is not a law, but the Thilawa SEZ Committee expects that business investing and doing business in the SEZ will Respect human rights; Engage with stakeholders; Support the rights of workers; Build human capital; Ensure effective grievance mechanisms; Be transparent; Create shared value; and Support the communities in which they operate, as stated in the guidance.

3.11 International Environmental Laws, Standards, and Guidelines

As mentioned above, Myanmar guidelines and environmental regulations are still under development. This project will follow international best practice, while taking care to respect the laws of Myanmar where they are or will be applicable, the project will also need to fill any gaps in environmental legislation with internationally accepted standards and guidelines. The following paragraphs summarize international agreements, standards, and guidelines that should serve as supporting best practices in case Myanmar law does not meet international standards. A short gap analysis follows.

JICA's Guidelines for Environmental and Social Considerations (ESC) (April 2010)

These guidelines form an integral part of all JICA assistance. If a significantly adverse impact on the environment or society has been identified during JICA-assisted project planning, JICA must take the necessary measures to ensure that the appropriate environmental and social considerations are given. The guidelines stipulate requirements to respect human rights for inclusive development, avoid adverse environmental and social impacts, secure local stakeholder consultation, provide disclosure to the public about ESCs, and respect host country laws, standards, policies, and plans. Furthermore, the guidelines provide guidance on project impact categorization and types of analysis and reporting (EIA, Resettlement Action Plan, Indigenous Peoples Plan) that are required to achieve JICA assistance.

In the JICA Environmental Guidelines it is stipulated that:

> *JICA confirms that projects do not deviate significantly from the World Bank's Safeguard Policies, and refers as a benchmark to the standards of international financial organizations; to internationally recognized standards, or international*

standards, treaties, and declarations, etc.; and to the good practices etc. of developed nations including Japan, when appropriate. When JICA recognizes that laws and regulations related to the environmental and social considerations of the project are significantly inferior to the aforementioned standards and good practices, JICA encourages project proponents etc., including local governments, to take more appropriate steps through a series of dialogues, in which JICA clarifies the background of and reasons for the inferior regulations and takes measures to mitigate the adverse impacts when necessary.

World Bank Environmental and Social Safeguard Policies

The World Bank Operations Manual is a document detailing international best practice in operations of an international loan project along, including specific guidance on dealing with environmental impacts. Particular to the present project, in this manual it is noted that mangrove swamp areas should be considered as important habitat as referenced in World Bank Operations Policies 4.04. Specific requirements are described in separate operational policies such as OP4.01 Environmental Assessment, OP4.04 Natural Habitat, OP4.03 Performance Standards for Private Sector Activities and so on.

International Environmental Law, Conventions, and Agreements

Myanmar is a signatory to the following international laws, protocols, conventions, and agreements:

- Air and Atmospheric Emissions:
    - Vienna Convention for Protection of the Ozone Layer
    - Montreal Protocol on Substances that Deplete the Ozone Layer
    - London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer
    - Copenhagen Amendment to the Montreal Protocol on Substances that deplete the Ozone Layer
    - United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol
    - ASEAN Agreement on Transboundary Haze
- Hazardous Waste and Toxic Substances
    - Stockholm Convention on Persistent Organic Pollutants
- Land Agreements
    - United Nations Convention to Combat Desertification
- Biodiversity, Forests, and Cultural Heritage
    - Convention Concerning the Protection of the World Cultural and Natural Heritage
    - Convention on Biological Diversity
    - Cartagena Protocol on Biosafety

- o International Tropical Timber Agreement
- o Ramsar Convention on Wetlands
- o Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- o Association of Southeast Asian Nations (ASEAN) Agreement on the Conservation of Nature and Natural Resources

3.12 Myanmar and International Guideline Gap Analysis

Gaps between requirements of the above international standards and Myanmar domestic law are presented in the table below. This table is not necessarily complete and only serves to fill in those gaps that are relevant to the present project. It must be noted that the Draft EIA Procedure and the EIA Guidelines have not been implemented as of the time of writing. These documents may go a significant way towards filling the gaps identified. For gaps identified, to the extent possible the Project will use international standards[4] to strengthen the environmental protection already afforded under Myanmar law.

Table 3-1 Gaps between Myanmar Law and International Guidelines.

JICA ESC Guidelines (April 2010) / World Bank Operations Manual and Operational Policies	Environmental Law	Gaps between International Standard and Laws of Myanmar	Methods for Implementing Best Practice
Basic Principles Regarding Environmental and Social Considerations			
Strategic Environmental Assessment (SEA) shall be applied when conducting a Master Plan Study, etc.	none	The laws of Myanmar do not have a provision for the creation of an SEA-like document for master plan type projects.	Implement an SEA as stipulated in the JICA Guidelines for Environmental and Social Considerations (April 2010), Section 3.1.2, para. 4.
Stakeholder participation and responsibility sharing	Draft EIA Procedure (24 December 2013 Draft) Paras. 2, 6, 28, 39, 50, 55	The Draft EIA Procedure has detailed processes for stakeholder participation and also rules for engaging with stakeholders. The Draft EIA Procedure does not put any particular responsibility on the stakeholder side.	Encourage stakeholders to take responsibility for their respective areas of concern during and after project building and implementation. JICA Guidelines for Environmental and Social Considerations (April 2010), Section 1.1/1.4 and relevant sections of the World Bank Operations Manual.
Environmental and Social Consideration Process			
Concern about Social Environment and Human Rights	Draft EIA Procedure (24 December 2013 Draft) *partial*	There are various general mentions of the need to include social considerations in the Draft EIA Procedure. However, there are no detailed guidelines	Implement best practice according to JICA Guidelines for Environmental and Social Considerations (April 2010), Section 3 and World Bank Operations Manual Series 4.00.

[4] In principal, international standards referenced might include the JICA Guidelines for Environmental and Social Considerations (April 2010) and the related World Bank Operations Manual.

JICA ESC Guidelines (April 2010) / World Bank Operations Manual and Operational Policies	Environmental Law	Gaps between International Standard and Laws of Myanmar	Methods for Implementing Best Practice
		stipulating how these processes should be carried out.	
Social acceptability	Draft EIA Procedure (24 December 2013 Draft) *partial*	There is some mention of the need to protect vulnerable groups such as indigenous people and women, but there are no detailed procedures for analyzing such impacts.	Implement best practice per World Bank Operations Manual Series 4.10.
Protected natural areas and ecosystems	Draft EIA Procedure (24 December 2013 Draft) Annex 1	There are provisions for the analysis of impacts to sensitive ecosystems as defined under relevant legislation and Government Notices. However, the Draft EIA Procedure only references existing definitions of natural areas and ecosystems without providing extended coverage for *ad hoc* inclusion of sensitive area impacts.	Implement preventative measures for sensitive ecosystems according to JICA Guidelines for Environmental and Social Considerations (April 2010), Appendix 1 and World Bank Operations Manual Series 4.04.
Advisory Committee for Environmental and Social Considerations	none	There is no independent committee reviewing EIAs in Myanmar.	Implement the provisions of JICA Guidelines for Environmental and Social Considerations (April 2010), Sec. 1.10.

4 Baseline Scoping

This scoping section will set out the baseline socio-environmental conditions, identify possible environmental issues/impacts related to changes in land use and Project implementation, review domestic Myanmar rules and regulations, and review the international guidelines that are applied to this project.

4.1 Baseline Information

The following section sets out the baseline—i.e. current—socio-environmental conditions of the Project. The information presented is intentionally brief and to the point and is meant to summarize the characteristics of the target site. Full data will be presented in Appendix D.

4.1.1 Pollution Control

In Myanmar there are currently no nationally required ambient environmental regulations. However, there are currently regulations under debate between MOECAF, Ministry of Industry (MOI), Ministry of Science and Technology (MOST) (and MOST's ESQ subcommittee), etc. As an interim measure before the national environmental regulations are implemented, it is proposed that the EIA for a new project will need to specify an Environmental Management Plan (EMP) with ambient and emissions standards set for the SEZ that are equivalent to the provisional Draft Domestic Pollution Control Standards. The various national environmental standards to be implemented on a rolling basis will take precedence and form the new minimum standard for the SEZ environmental regulations.

For the Project, it is proposed that environmental standards for the entire Thilawa SEZ including the 2,000ha area and 400ha Zone A area will be set in coordination. However, at a minimum the standards set for the 2,000ha area will conform to IFC standards and/or any Myanmar interim standards that are published before the SEA for the 2,000ha area is finalized. These zone-wide standards will also be backed up by factory-based ambient and emissions standards. For example, a factory will be required to meet a certain minimum standard for wastewater effluent before discharging that effluent to the SEZ-wide wastewater processing facilities.

1) Air

The Project area is overwhelmingly dominated by agricultural land and as such air pollution on site is relatively minimal. The data collected and the results indicate that the air quality survey in the Thilawa area is generally good in the rainy season but worsens during the dry season, particularly for particulate parameters. The baseline survey was conducted in both the dry season and the rainy season. 24 hour data was taken twice on consecutive days at 6 different air quality monitoring (AQM) points. The AQM points were chosen to provide a

comprehensive evaluation of the general air quality of the area including existing potentially significant air emissions sources and roads. As air quality is affected by moisture in the air and temperature, days for measurement were chosen according to being hot and dry during the dry season and relatively wet during the rainy season. These points are presented in the figure below.

Source: SEZ Management Committee

Figure 4-1 Air Quality Sampling Points

Table 4-1 Ambient Air Quality Survey Results

		Quantitative Target	Rainy Season Average	Dry Season Average
AQM-1	PM10	24 hr ave < 150 μg/m^3	24.1	71
	TSP	24 hr ave < 260 μg/m^3	35.6	145
	CO	1 hr ave < 9 ppm	0.108	0.094
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.059	0.087
AQM-2	PM10	24 hr ave < 150 μg/m^3	11.5	108
	TSP	24 hr ave < 260 μg/m^3	14.8	308
	CO	1 hr ave < 9 ppm	0.017	0.022
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.045	0.068
AQM-3	PM10	24 hr ave < 150 μg/m^3	16.4	81
	TSP	24 hr ave < 260 μg/m^3	29.8	175
	CO	1 hr ave < 9 ppm	0.015	0.367
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.059	0.059
AQM-4	PM10	24 hr ave < 150 μg/m^3	13.9	108
	TSP	24 hr ave < 260 μg/m^3	21.2	237
	CO	1 hr ave < 9 ppm	0.053	0.114
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.057	0.096
AQM-5	PM10	24 hr ave < 150 μg/m^3	9.3	34
	TSP	24 hr ave < 260 μg/m^3	10.8	61
	CO	1 hr ave < 9 ppm	1.426	0.818
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.051	0.038
AQM-6	PM10	24 hr ave < 150 μg/m^3	16.1	54
	TSP	24 hr ave < 260 μg/m^3	24.2	97
	CO	1 hr ave < 9 ppm	0.017	ND
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.058	0.330

PM10=Particulate Matter; TSP=Total Suspended Particulates; CO=Carbon Monoxide; SO2=Sulfur Dioxide; NO2=Nitrogen Dioxide; ND=Not Detected at lower detection limit.
Notes: Data taken over the period from 29 May 2014 to 06 June 2014 for the rainy season and March 30-April 4, 2015 for the dry season.

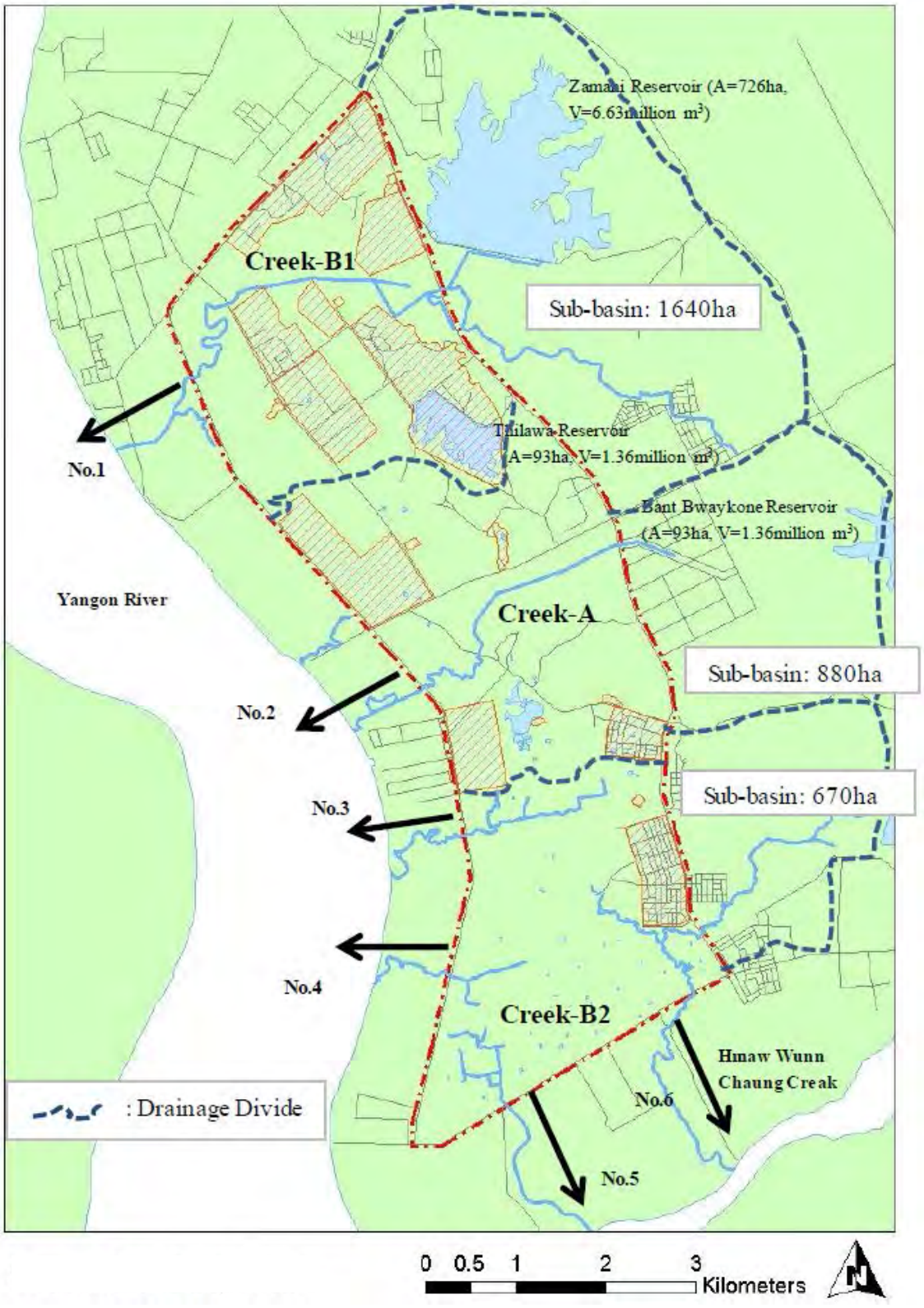
Source: SEZ Management Committee

It should also be noted that there are surrounding commercial and industrial developments, such as the Myanmar Port Authority, the towns of Thanlyin/Kyauktan, etc. that are considered to be existing contributors to the air-shed quality.

2) Surface and Groundwater

There are two main bodies of water near to the site. The site is proximate (~700m) to the right bank of the Yangon River, which flows from north to south, and the right bank of the Hmawwun River, which flows from east to west and drains into the Yangon River. There are four streams on the site that flow east to west into the Yangon River and two streams that flow north to south into the Hmawwun River. Roughly 21km downstream of the bank closest to the southwestern tip of the 2,000ha area the Yangon River flows into the Gulf of Martaban and the Indian Ocean.

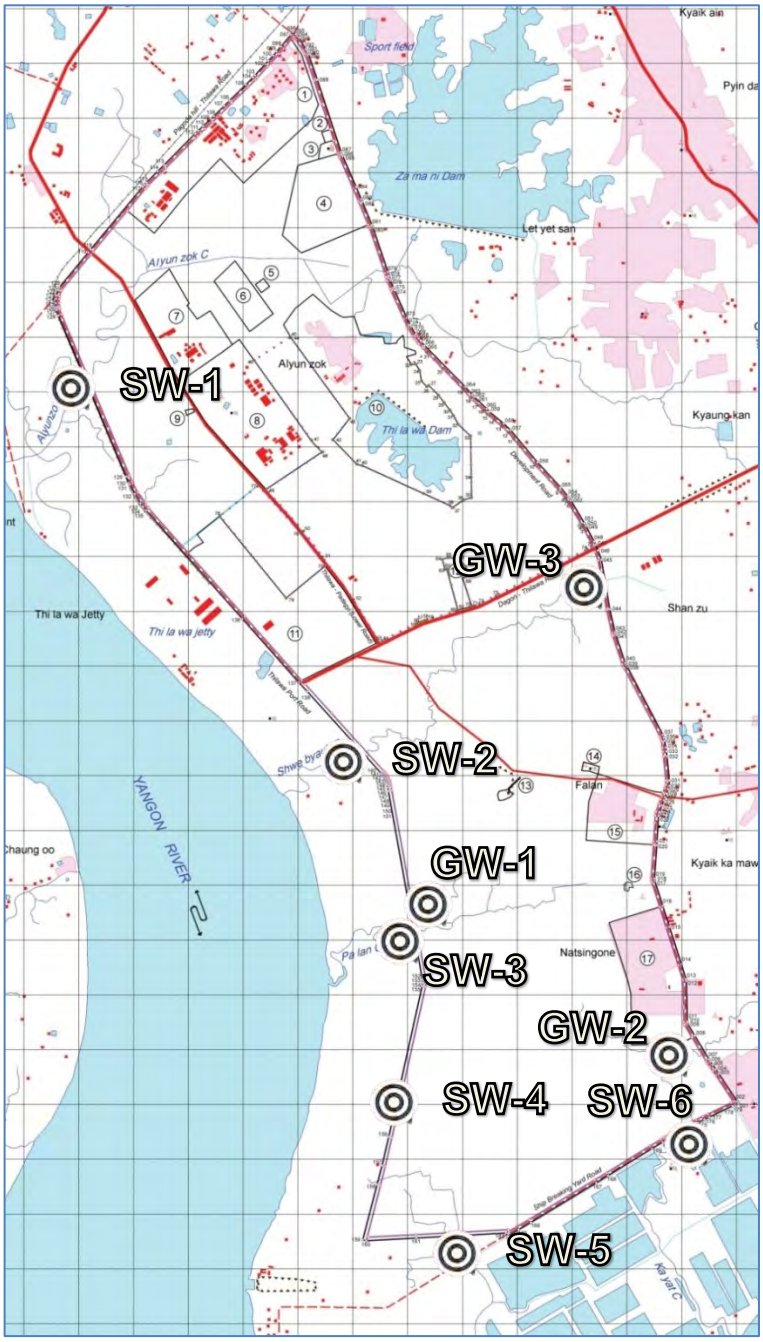
As for water resources directly in the 2,000ha area there are the six on-site streams mentioned above and two permanent bodies of water: the Thilawa Reservoir in the north-central area and the Bant Bway Kkone Reservoir in the south-central area. There are two additional permanent bodies of water directly to the east of the site: the Zarmani Reservoir to the northeast and the Bant Bway Kone Reservoir to the east. The two northern-most streams exiting from the western border of the 2,000ha zone are fed from these latter two reservoirs and rainwater catchment. The two remaining southern streams exiting the western border as well as the two streams exiting the southern border are fed by rainwater catchment on and off the site. All reservoirs in and around the site are in turn fed by rainwater catchment. In the rainy season the water flowing off site is significant, but in the dry season the streams experience tidal intrusion with most of the water in the streams immediately around the borders consisting of brackish seawater.



Source: JICA (2013) *Preparatory Study on Thilawa Special Economic Zone (SEZ) Infrastructure Development in the Republic of the Union of Myanmar*

Figure 4-2 Bodies of Water in the Vicinity of the 2,000ha Zone

The water quality survey was conducted with a limited parameter set monthly for one year with an additional extended parameter set. Six surface water (SW-1 to SW-6) points and three groundwater (GW-1 to GW-3) were selected as representative samples of surface and groundwater quality in the area.



Source: SEZ Management Committee

Figure 4-3 Surface and Groundwater Monitoring Points

The results of the monitoring are as below.

Table 4-2 Surface and Groundwater Sampling Results (Limited Parameter Set)

Parameter	Unit	Sample Date											
		18/12/2013	2014/1/7	2014/1/30	2014/2/18	2014/3/14	2014/4/1	2014/4/25	2014/5/16	2014/6/3	2014/6/24	2014/7/15	2014/8/5
SW-1													
Temp	**°C**	25.3	23.9	24.8	26.2	35.3	31.2	33.4	29.6	31.7	28.4	28.7	27.4
Flow*	**m^3/s**	-	-	-	-	-	-	-	-	-	-	-	-
Level/Depth	**m**	- /0.12	- /0.13	- /0.14	- /0.2	- /0.1	- /0.2	- /0.2	- /0.2	- /0.2	- /1.6	4 /-	3 /-
Odor	**-**	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy
Color	**TCU**	-	45	130	50	20	10	10	10	40	60	100	50
EC	**µs**	1956	142	223	1735	21.67	23.01	20.61	20.61	659	226.1	82.9	51.4
pH	**-**	7	6.9	7.1	7.1	8.66	7.7	7.32	7.32	6.57	6.38	6.39	6.13
BOD	**mg/L**	3.2	1	2.5	2.5	2	2	2.5	2	2	2.5	2	1.5
SS	**mg/L**	540	1068	1035	1912	110	36	36	36	68	382	172	92
DO	**mg/L**	5.2	4	5	4.5	10.36	4.12	4.12	4.12	46.6	3.08	50.5	39.6
SW-2													
Temp	**°C**	23.6	24.2	24.6	26.4	33.3	30.8	33.9	27.1	31.3	28.2	28	27.4
Flow*	**m^3/s**	0.141	0.129	0.102	0.085	0.083	0.089	0.083	0.083	-	-	-	-
Level/Depth**	**m**	-	-	-	-	-	-	-	-	-	-	-	-
Odor	**-**	muddy	muddy	muddy	muddy	muddy	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	20	80	95	90	25	50	80	80	120	90	160	80
EC	**µs**	1792	411	293	1086	21.47	25.95	22.03	22.03	6.74	325.9	211.1	42.6
pH	**-**	6.8	6.7	7.2	7.1	8.37	7.39	7.98	7.98	7.81	6.73	7.25	6.39
BOD	**mg/L**	0.5	2	2	2	1.5	2	2.5	2	1.5	2	2	1
SS	**mg/L**	526	1052	505	1983	103	95	95	95	388	1320	300	188
DO	**mg/L**	5	4	4.5	4	8.96	4.01	4.01	4.01	3.93	4.23	58	43.2
SW-3													
Temp	**°C**	25.3	24.8	23.8	27.3	34.5	31.8	34.3	29.6	30.2	28.5	27.7	27.1
Flow*	**m^3/s**	-	0.105	0.089	0.068	0.058	0.056	0.051	0.051	-	-	-	-
Level/Depth**	**m**	- /0.12	-	-		-	-	-	-	-	-	-	-
Odor	**-**	muddy	muddy	muddy	muddy	muddy	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	-	90	75	55	60	40	70	70	80	60	190	60
EC	**µs**	1956	283	765	965	26.52	26.88	20.22	20.22	8.49	1486	495.4	150.2
pH	**-**	7	6.8	7.1	7.1	8.5	7.73	7.76	7.76	7.73	7.08	7.19	6.7
BOD	**mg/L**	3.2	3	2.5	2.1	1.5	1.5	1	1.5	1.5	2.2	1.5	1
SS	**mg/L**	540	584	1403	1739	549	78	78	78	136	136	422	118
DO	**mg/L**	5.2	5	5	4	7.57	4.5	4.5	4.5	3.46	4.68	60.5	52.9
SW-4													
Temp	**°C**	25.9	25.3	26.1	30.2	34.4	31.1	36	29.5	30.4	29.2	28.1	27
Flow*	**m^3/s**	0.078	0.067	0.055	0.055	0.046	0.041	0.042	0.042	-	-	-	-
Level/Depth**	**m**	-	-	-		-	-	-	-	-	-	-	-/2

Parameter	Unit	Sample Date											
		18/12/2013	2014/1/7	2014/1/30	2014/2/18	2014/3/14	2014/4/1	2014/4/25	2014/5/16	2014/6/3	2014/6/24	2014/7/15	2014/8/5
Odor	-	muddy	muddy	muddy	muddy	muddy	nil	nil	nil	nil	nil	nil	nil
Color	TCU	20	180	35	50	35	70	40	40	140	220	120	90
EC	µs	1669	189	297	951	29.74	26.93	22.92	22.92	13.63	5.26	900	291.3
pH	-	7.2	7	7.2	7.1	8.67	7.46	8.05	8.05	7.44	7.08	7.33	7.11
BOD	mg/L	3.2	3	2.7	2.1	2	2	2	1.5	2	2.5	2	1.5
SS	mg/L	615	571	1043	1615	190	128	128	128	385	1930	188	152
DO	mg/L	5.2	4	5.2	4	5.57	4.11	4.11	4.11	4.27	62.4	79.3	54.1
SW-5													
Temp	°C	25.1	25.7	26.4	31	30.4	31	33	29.5	30.8	29.9	28.2	27.3
Flow*	m^3/s	-	-	-	-	-	-	-	-	-	-	-	-
Level/Depth	m	- /0.2	- /0.23	- /0.22	- /0.2	- /0.18	- /0.28	- /0.8	-/0.3	-/0.4	-/2.4	-/0.7	-/2
Odor	-	foul	foul	muddy	foul	foul	nil	nil	nil	nil	nil	nil	nil
Color	TCU	40	110	280	70	25	90	30	30	60	130	40	70
EC	µs	1666	252	1344	713	14.92	31.95	33.95	33.95	151.6	4993	1611	300.8
pH	-	7.1	6.8	6.8	7.1	7.23	7.23	7.57	7.57	7.58	7.24	7.19	6.94
BOD	mg/L	1	3	2	2.5	1.5	2.5	2	1	2	2.5	2.5	1.5
SS	mg/L	1253	710	1354	1442	102	147	147	147	160	1460	92	195
DO	mg/L	5	4	5	4.5	5.4	4.73	4.73	4.73	4.22	52.8	55.2	43.5
SW-6													
Temp	°C	25.5	26.1	25.6	29.7	29.7	29.9	34.2	28.3	30.5	29.1	28.1	28.1
Flow*	m^3/s	-	-	-	-	-	-	-	-	-	-	-	-
Level/Depth	m	- /0.25	- /0.29	- /0.28	- /0.3	- /0.25	- /1.5	- /1.0	- /1.5	- /0.9	- /2.2	- /1.0	- /1.2
Odor	-	foul	foul	foul	foul	foul	fishy	fishy	fishy	fishy	fishy	fishy	fishy
Color	TCU	40	50	40	15	10	30	10	10	20	80	70	45
EC	µs	1891	262	1523	836	25.85	30.03	35.25	35.25	19.95	1405	568	80.3
pH	-	7.2	6.9	6.9	7.1	7.04	7.36	7.95	7.95	7.49	7.1	7.18	6.72
BOD	mg/L	2.2	3	2	2.5	2	1.5	2	1	2	2.5	2.5	1.5
SS	mg/L	1213	1477	998	1749	45	52	52	52	58	1220	116	98
DO	mg/L	5.2	4	4	4.5	4.01	3.8	3.8	3.8	54.6	50.2	50.8	43.5
GW-1													
Temp	°C	25.9	25.2	27	28.7	29.6	28.4	29.6	29.1	29.5	28.6	29.1	28.5
Water level	m	2.1/2.3	2.5/1.8	2.8/1.5	2.7/1.6	3.6 /0.9	4.3/2.7	4.3/3.1	4.3/3.0	2.5/1.5	1.2/4.3	1.1/4.4	1/4.3
Odor	-	rusty	rusty	nil	nil	nil	rusty	rusty	rusty	rusty	rusty	rusty	rusty
Color	TCU	5	20	nil	nil	nil	nil	nil	nil	nil	nil	nil	5
EC	µs	1478	110	256	974	98	87	79.9	79.9	124.4	95.7	102.3	58.8
pH	-	6.8	6.8	4	4	4.73	4.65	4.96	4.96	5.06	4.65	4.53	5.57
GW-2													
Temp	°C	26.2	25.9	27	27.2	28.6	28.8	29.9	29.2	28.8	28.8	28.7	28.8
Water level	m	3.8/2.5	2.9/2.4	2.7/2.9	3.1/2.4	6.4/2.1	6.4/2.1	6.4/1.4	6.4/1.8	3.2/1.5	1.8/4.7	1.5/4.0	1.1/4.1

Parameter	Unit	Sample Date											
		18/12/2013	2014/1/7	2014/1/30	2014/2/18	2014/3/14	2014/4/1	2014/4/25	2014/5/16	2014/6/3	2014/6/24	2014/7/15	2014/8/5
Odor	**-**	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	10
EC	**µs**	1461	101	105	653	54	50.8	68	68	59	67.4	62.7	58.6
pH	**-**	6	6	4.5	6	4.85	5.04	5.29	5.29	5.13	5.07	4.98	5.07
GW-3													
Temp	**°C**	25.8	24.8	27	26.1	29.3	28.4	31	29.3	29.6	29.3	29.2	28.9
Water level	**m**	2.5/3.5	2.3/3.5	3.5/2.8	3.3/3.0	4.2/2.2	4.2/1.6	4.2/1.7	4.2/3.7	0.6/5.6	1.1/5.2	0.7/5.3	0.8/5
Odor	**-**	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	30	25	5	nil	nil	nil	nil	nil	nil	nil	nil	nil
EC	**µs**	1492	90	454	640	124.5	141.3	223.5	223.5	219.1	89.7	68.7	106.6
pH	**-**	6	6.2	5.5	4	4.85	6.37	6.82	6.82	6.05	5.8	5.53	4.6

Note: flow and depth measurements were taken at low tide to identify off-site flow and to minimize the impact of tidal fluctuations on measured values.
*Flow measurements were only able to be taken intermittently due to blockage of rivers by local residents for agricultural activities.
**Depth measurements were nil at low tide.
Source: SEZ Management Committee

Table 4-3 Surface Water Sampling Dry Season Results (Extended Parameter Set)

Parameter	Unit	Quantitative Target	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
Total Coliform	**cfu/100mL**	**-**	$3.5x10^3$	$2x10^3$	$1.5x10^3$	$8x10^3$	$2.3x10^3$	$6x10^3$
COD	**mg/L**	**-**	1.84	1.104	ND	2.208	3.680	0.368
Total Nitrogen	**mg/L**	**-**	6.3	3.5	19.6	7.7	21.00	7.70
Total Phosphorous	**mg/L**	**-**	0.004	0.028	0.036	0.044	0.028	0.084
Turbidity	**NTU**	**-**	171	1220	1310	1450	2250	13
Arsenic (As)	**mg/L**	**0.340**	10.9	7.4	9.5	8.2	8.6	7.838
Mercury (Hg)	**mg/L**	**0.0014**	ND	ND	0.003	0.004	0.006	0.007
Lead (Pb)	**mg/L**	**0.065**	0.025	0.017	0.034	0.03	0.12	0.065
Cadmium (Cd)	**mg/L**	**0.002**	ND	ND	ND	ND	ND	ND
Chromium (Cr)	**mg/L**	**0.016**	1.75	1.67	1.81	1.48	1.45	3.8
Copper (Cu)	**mg/L**	**0.0023**	0.018	0.017	0.017	0.016	0.02	0.022
Zinc (Zn)	**mg/L**	**0.12**	0.01	0.013	0.007	0.015	0.03	0.075
Nickel (Ni)	**mg/L**	**0.47**	0.18	0.17	0.181	0.185	0.283	0.95
Iron (Fe)	**mg/L**	**-**	0.88	2.20	2.60	3.72	4.6	0.58
Cyanide (CN)	**mg/L**	**0.022**	0.002	0.009	0.006	0.005	0.002	0.008

ND=Not Detected
Source: SEZ Management Committee Study

Table 4-4 Groundwater Sampling Dry Season Results (Extended Parameter Set)

Parameter	Unit	Quantitative Target	GW-1	GW-2	GW-3
Total Coliform	**cfu/100mL**	**ND**	1 x10^2	2 x10^2	5 x10^2
Arsenic (As)	**mg/L**	**0.01**	3.682	ND	6.9
Mercury (Hg)	**mg/L**	**0.006**	0.019	0.033	0.093
Lead (Pb)	**mg/L**	**0.01**	ND	ND	ND
Cadmium (Cd)	**mg/L**	**0.003**	ND	ND	ND
Chromium (Cr)	**mg/L**	**0.05**	1.07	0.998	1.43
Copper (Cu)	**mg/L**	**2**	0.002	0.002	0.002
Zinc (Zn)	**mg/L**	**-**	0.04	0.029	0.003
Nickel (Ni)	**mg/L**	**0.07**	0.093	0.065	0.061
Iron (Fe)	**mg/L**	**-**	0.20	0.22	0.28
Cyanide (CN)	**mg/L**	**-**	0.002	0.005	0.004
Fluoride	**mg/L**	**1.5**	ND	ND	ND
Hardness	**mg/L**	**-**	6	6	20
Nitrates (NO3-N)	**mg/L**	**50**	0.104	0.120	0.98
Nitrites (NO2-N)	**mg/L**	**3**	0.01	ND	ND
Ammonium Nitrogen (NH4)	**mg/L**	**-**	ND	ND	ND

ND=Not Detected
*WHO and USEPA do not specify specific targets for these items.
Source: SEZ Management Committee Study

3) Wastewater

In industrial parks both in Myanmar and in other countries, it is now a common practice to establish a two-step effluent quality checkpoint system whereby wastewater effluent standards are set both at the individual factory level and further on at the SEZ-wide level. The 2,000ha area standards will reflect those employed in the Zone A while also taking care to adopt national standards as they come into force as a minimum. The table below shows various standards available for consideration, including the MOI standards adopted in the Zone A .

Table 4-5 Allowable Wastewater Discharge to Water Body (National Wastewater Effluent Standards under Consideration Applicable to SEZ)

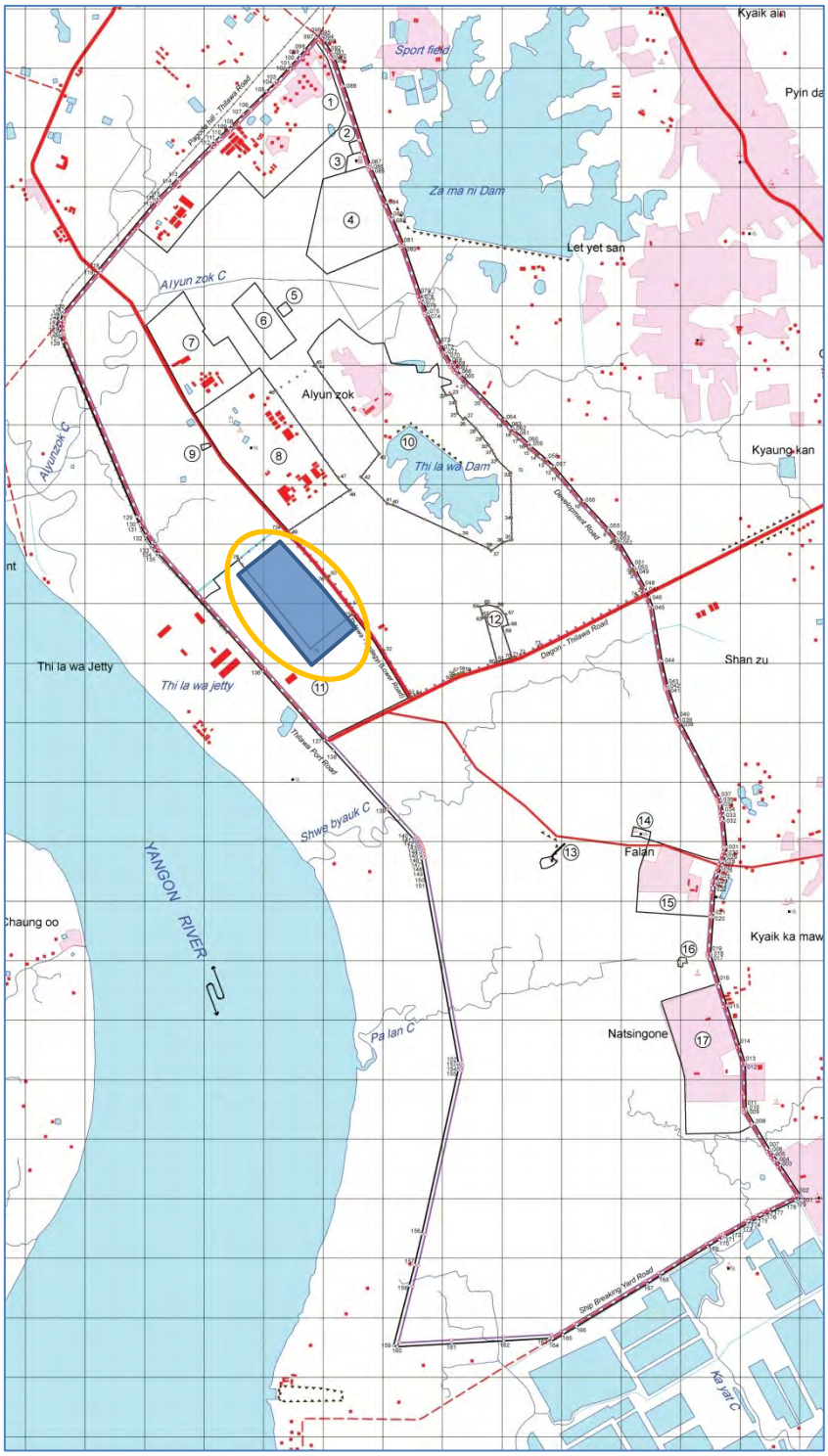
Parameter	Unit	Zone A	Dowa Waste Facility	IFC	China	Vietnam	MEP	MOI	MOM	YCDC
Physical										
Temperature	°C	**35**	40	-	-	40-45	-	40	-	-
Temp. ∆@zone of discharge	°C	-	-	**<3**	-	-	-	-	-	-
Dissolved Solids	mg/L	**2,000**	**2,000**	-	-	-	-	**2,000**	-	-
Suspended Solids	mg/L	**30**	**30**	50	20-800	50-200	50	**30**	-	<500
Coliform Bacteria	MPN/ 100ml	**<400**	-	**<400**	-	5-10,000	**<400**	-	-	-
Color/Odor	Co-Pt	**150**	Not objectionable	-	-	-	-	-	-	-
Chemical										
pH	units	**6.5-8.5**	5-9	6-9	6-9	5-9	6-9	5-9	6-9	6-9
Total Heavy Metals	mg/L	-	-	10.0	-	-	**10.0**	-	-	-
Iron (Fe)	mg/L	-	-	**3.5**	-	1.0-10.0	**3.5**	-	-	-
Zinc (Zn)	mg/L	5.0	5.0	**2.0**	2.0-5.0	1.0-5.0	**2.0**	5.0	-	-
Copper (Cu)	mg/L	1.0	1.0	**0.5**	0.5-2.0	0.2-5.0	**0.5**	1.0	-	-
Silver (Ag)	-	-	-	**0.5**	**0.5**	-	**0.5**	-	-	-
Chromium (Cr)	mg/L	0.5	0.5	**0.1**	0.5	0.05-0.5	**0.1**	0.5	-	-
Cadmium (Cd)	mg/L	**0.03**	**0.03**	0.1	0.1	0.01-0.5	0.1	**0.03**	-	-
Total Mercury (Hg)	mg/L	**0.005**	**0.005**	0.01	0.05	0.005-0.01	0.01	**0.005**	-	-
Barium	mg/L	**1.0**	**1.0**	-	-	-	-	**1.0**	-	-
Nickel (Ni)	mg/L	**0.2**	**0.2**	0.5	1.0	0.2-2.0	0.5	**0.2**	-	-
Phosphate (PO_4-P)	mg/L	-	-	**2.0**	-	-	-	-	-	-
Lead (Pb)	mg/L	0.2	0.2	**0.1**	1.0	0.1-1.0	**0.1**	0.2	-	-
Arsenic (As)	mg/L	0.25	0.25	**0.1**	0.5	0.05-0.5	**0.1**	0.25	**0.1**	-
Selenium (Se)	mg/L	**0.02**	**0.02**	0.1	-	-	0.1	**0.02**	-	-
Cyanide	mg/L	**0.2**	**0.2**	1.0	0.5-1.0	-	1.0	**0.2**	-	-
Sulfide (S)	mg/L	1.0	1.0	1.0	1.0	**0.2-1.0**	1.0	1.0	-	-
Fluoride	-	-	-	20.0	10.0-30.0	**1.0-5.0**	20.0	-	-	-
Chlorine (Cl_2)	mg/L	1.0	1.0	**0.2**	-	-	-	1.0	-	-
Formaldehyde	mg/L	**1.0**	**1.0**	-	-	-	-	**1.0**	-	-
Permanganate	mg/L	-	**60**	-	-	-	-	-	-	-
Oxygen Demand										
Biological (BOD)	mg/L	**20**	20-60	50	20-600	20-100	50	20-60	-	20-60
Chemical (COD)	mg/L	**60 (Cr)** 35 (Mn)	-	250	60-1,000	50-400	250	-	150	<200
Free Ammonia (NH3-N)	mg/L	-	-	-	-	**0.1-10.0**	10.0	-	-	-
Total Nitrogen (T-N)	mg/L	**5.0**	-	10.0	-	**-**	-	-	-	-
Other										

Parameter	Unit	Zone A	Dowa Waste Facility	IFC	China	Vietnam	MEP	MOI	MOM	YCDC
Phenols / cresols	mg/L	1.0	1.0	**0.5**	0.5-2.0	0.001-1.0	**0.5**	1.0	-	-
Mineral Oil (hydrocarbons)	mg/L	**5**	**5**	10	20-100	-	10	**5**	15	-
Tar	-	**ND**	**ND**	-	-	-	-	**ND**	-	-
Radioactivity and insecticides	-	**ND**	**ND**	-	**ND**	-	-	**ND**	-	-

Acronyms: ND=non-detected; IFC=International Finance Corporation; MEP=Ministry of Electrical Power; MOI=Ministry of Industry; MOM=Ministry of Mines; YCDC=Yangon City Development Committee
Notes: Bolded items represent the strictest standards for each regulation.
Source: Referenced from consultation with MOECAF ESQ Subcommittee #17 on Air Quality Standards, Water Quality Standards, Drinking Water Standards, and Pesticide Residue Specifications.

4) Solid Waste

Dowa Eco-System Ltd., a Japan-based company, has received approval for and is constructing a solid waste treatment facility in the western portion of the Zone A area. This facility will receive solid waste from the entire SEZ area as a priority. The location of this facility vis-à-vis the project is outlined in the figure below.



Source: Dowa Eco-System Ltd. (2015). Project on Construction of Solid Waste Management Facilities in Thialwa SEZ Zone A Area

Figure 4-4 Location of Solid Waste Management Facility

According to the EIA report for this facility, the facility will receive industrial non-hazardous, hazardous and recyclable waste. The proposed capacity for the project is as follows:

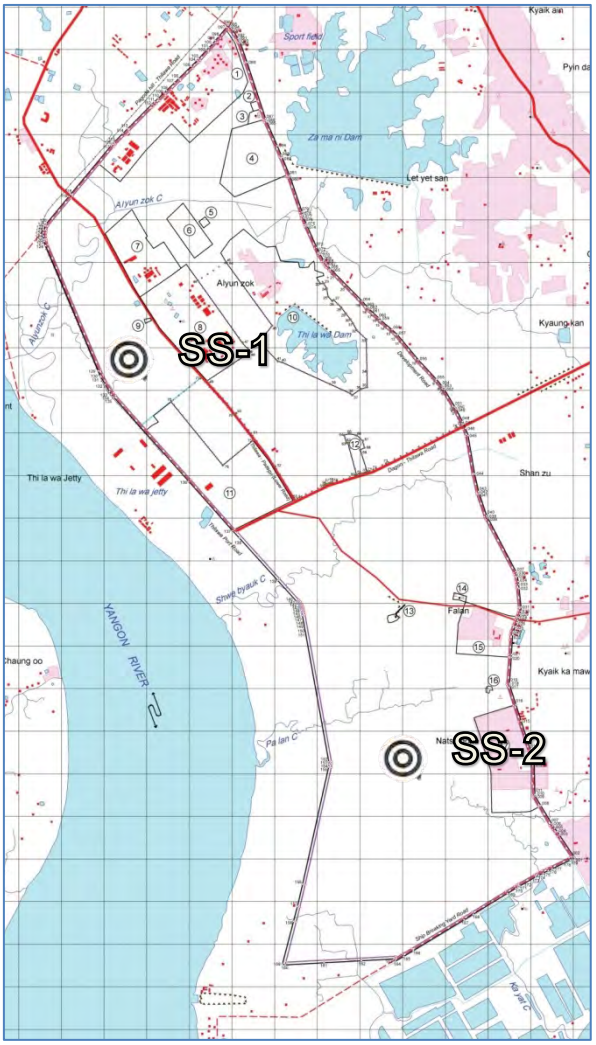
(i) Recyclables, hazardous and non-hazardous waste disposal (including

incineration/landfilling): 10,000-30,000 tons/year (30-80 tons/day)
(ii) Non-hazardous waste incineration: 20 tons/day (<1 ton/hr)

Organic waste will be collected by YCDC and taken off site to existing YCDC facilities in order to prevent vermin being attracted to the Dowa site. In addition to the Solid Waste Management Facility in the Zone A area, according to the Yangon City Development Committee (YCDC), there are currently plans to build a new incinerator with capability for 100 tons/day capacity for industrial hazardous waste coming out of the Thilawa SEZ. There are furthermore two additional landfills being set aside. The first landfill has an area of 30 acres and the land for this landfill has already been secured. The second landfill is planned to be 200 acres but the land for this landfill has not been secured yet. According to YCDC, the existing capacity for solid waste management in Thilawa is around 500 tons/day for non-industrial waste.

5) Soil

A soil contamination survey was undertaken at two points as shown in the figure below.



Source: SEZ Management Committee

Figure 4-5 Baseline Soil Sampling Points

The Project area is green-field. Given the past activity of the area, agricultural and

residential with some light industry, a limited parameter set was evaluated for naturally occurring metals. When compared to WHO threshold levels, the soil samples taken from each of these sample points did not show any contamination beyond guideline values. However, there were slight elevations in Chromium, Lead, and Cadmium that are possibly a result of natural lateritic soil content.

Table 4-6 Baseline Soil Contamination

Parameter	Unit	WHO Recommended Maximum Soil Concentrations for Agricultural Purposes	Measured result	
			SS-1	SS-2
Cadmium	mg/kg	<4.0	1.35	1.65
Chromium	mg/kg	-	47.12	63.75
Lead	mg/kg	<84.0	13.97	25.8
Arsenic	mg/kg	<8.0	ND	ND
Mercury	mg/kg	<7.0	ND	ND
Copper	mg/kg	-	7.6	17.12
Zinc	mg/kg	-	28.95	155.85

Source: SEZ Management Committee

6) Noise and Vibration

There are no regulations requiring a certain noise threshold currently under Myanmar domestic law. In April (dry season) and June (rainy season) of 2013, there was a noise survey conducted in the Moekyoswan Monastery compound and on a road in front of the Maritime University near Zarmani Dam. The baseline noise levels measured consistently exceeded IFC guideline noise levels (55dB daytime, 45dB nighttime) for residential/institutional/educational areas. IFC guidelines stipulate that the project noise levels at operation should not result in an increase above 3dB greater than background levels or a total of 70dB in industrial and commercial areas.

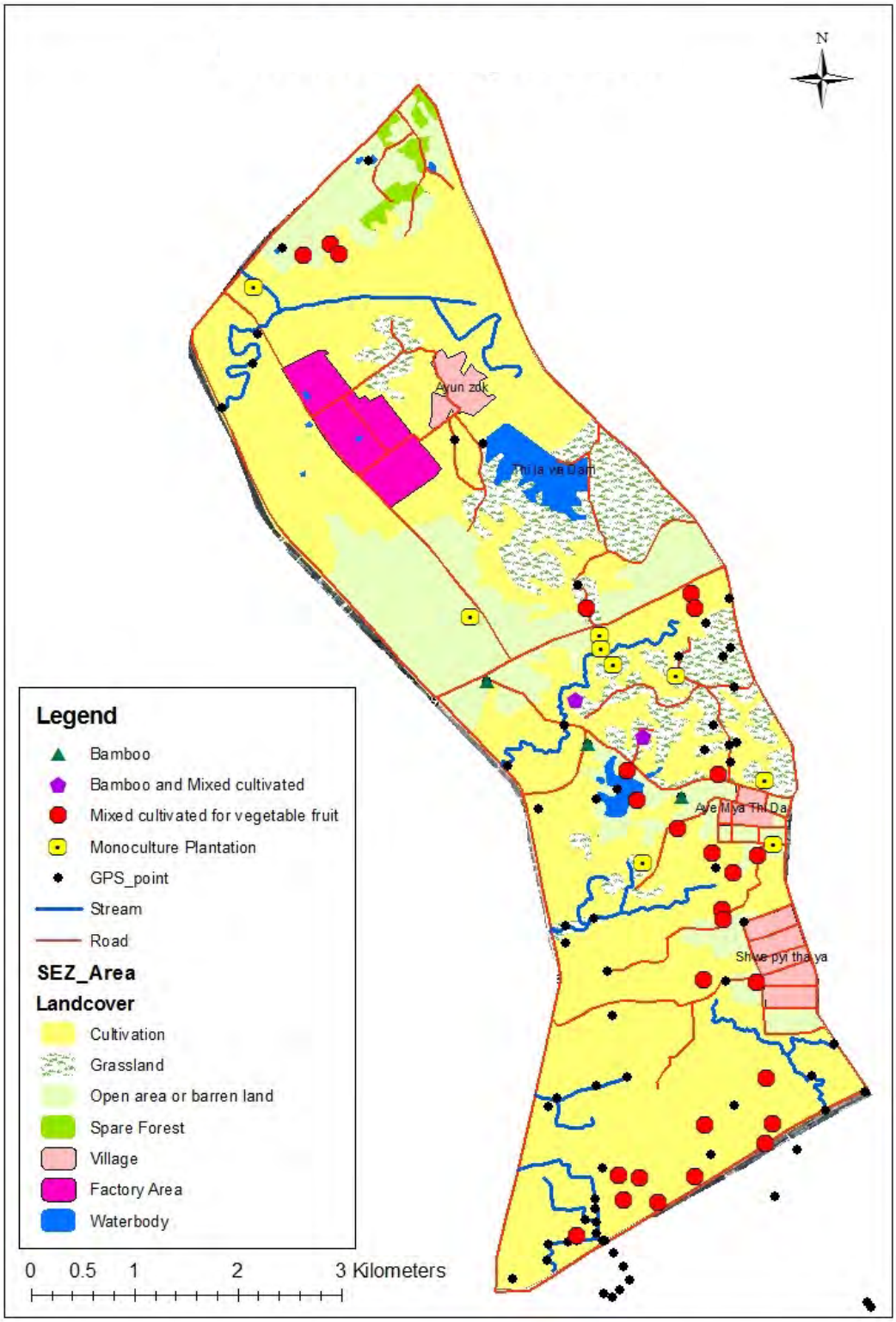
4.1.2 Natural Environment

The environment in the area is almost entirely converted from the native forest habitat and is presently dominated by agricultural use with some mixed industrial use. The table and figure below give an overview of current habitat typology in the area.

Table 4-7 Existing Habitat Typology

	Land Use Type	Area (km^2)
1	commercial area	0.139
2	cultivated land	12.389
3	education and culture facilities	0.500
4	grass land	5.975
5	industrial area	0.771
6	open space	4.911
7	residential area	1.693
8	swamp area	0.315
9	under developing area	1.002
10	water surface	0.752
	Total	**28.447**

Note: The type and data are based on the report of The Project for the Strategic Urban Development Plan of the Greater Yangon modified in association with the satellite image of Thilawa SEZ area.
Source: SEZ Management Committee Consultants



Source: SEZ Management Committee Consultants

Figure 4-6 Existing Habitat Typology

1) Biodiversity (Fauna)

The apparent fauna on and around the 2,000ha site is of a wide variety. A total of 180 fauna species representing 91 birds (70 species present in cool dry season and 55 species

present in rainy season), 31 fishes (16 species present in cool dry season and 27 species present in rainy season), 20 amphibians and reptiles (14 species present in cool dry season and 20 species present in rainy season) and 38 insect species (14 species present in cool dry season and 37 species present in rainy season) were recorded. No endangered species[5] have been identified on site. There was one bird species *Ploceus hypoxanthus* identified on site that is classified as Near Threatened on the IUCN Redlist. There were three fish species, *Labeo nandina*, *Anguilla bicolor,* and *Wallago attu* that are classified as Near Threatened on the IUCN Redlist.

Apart from the IUCN Redlist classification, there are some domestically protected[6] bird species that have been identified within the 2,000ha zone, namely the white-throated babbler (*Turdoides gularis*), which is endemic to Myanmar. Avian wildlife is particularly concentrated in and around water habitats. The mangrove embankments and onsite ponds/lakes provide a habitat for domestically protected birds. Of the 91 unique bird species identified on site, there were 35 bird species were identified in the water and marshland habitat.

Likewise, for aquatic species, the tidal influence on the streams on site and calm waters sheltered by mangrove river embankments may be a relatively important water area in the Yangon River deltaic sub-region that might provide shelter for fish spawning.

2) Biodiversity (Flora)

The flora in the project area belongs to Asia tropical coastal tidal region. According to WWF Eco-regions (Figure below), the study area is situated in the Myanmar coastal mangroves and Myanmar coastal rain forest. Mangrove species grow only in the brackish or salty water and are sensitive to the changes of ecosystem. Since at least colonial times, forest lands in the Project area have been converted to agriculture land and other development activities. The mangroves lining the banks of the rivers and creeks are subject to severe degradation because there is no clear-cut land-use system in the past and mangrove resources have most likely been used in an informal way over the past. Mangroves today are found only in small patches along the creek and river banks.

Today, dominant mangrove species are *Sonneratia caseolaris (L.) Engl., Avicennia spp., Sonneratia apetala Buch.-Ham.,* and *Excoecaria agallocha L.*, which are Irrawaddy Mangroves according to WWF. These species are growing wild in patches along the bank of Yangon River and the creeks which drain into it. Only 9 mangrove species (7 species in direct impact zone and 9 species in indirect impact zone) and 27 mangrove associate species are extant in summer with 4 additional mangroves associate species extant in the rainy season are growing in patches along the bank of creeks and Yangon River.

There were two IUCN Redlist endangered or near threatened species found in the area, *Dalbergia cultrate* Grah. and *Dipterocarpus alatus* Roxb. They do not occur naturally here and are both cultivated *ex situ* at monasteries or village homesteads. The location of the *Dipterocarpus alatus* Roxb. specimen may be within the project area itself nearby Phalan village. Steps should be taken to avoid the destruction of this specimen.

Table 4-8 Endangered or Near Threatened Flora Species

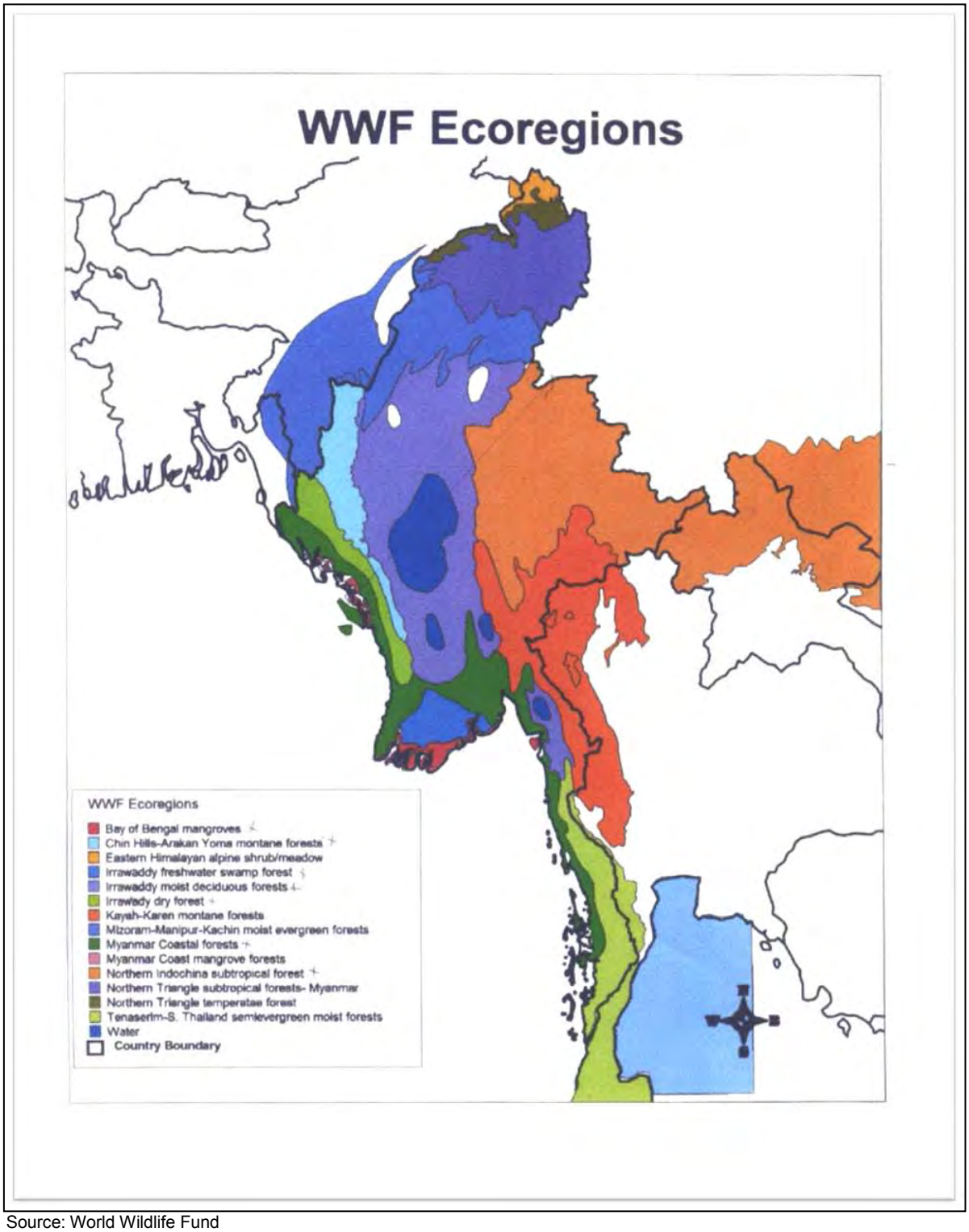
	Scientific Name	Family Name	Vernacular Name	IUCN criteria	Place	Location
1	*Dalbergia cultrata* Grah.*	Fabaceae	Yin-daik	NT	Moekyoswum Monastery	N16° 40' 24.8" E96° 16' 30.9"

[5] Status as determined under the International Union for Conservation of Nature's (IUCN) Red List.
[6] Protected under the Forest Department Notification No. 583/94 (http://www.esabii.org/database/others/documents/Myammer_NoticeNo583_94.pdf)

2	*Dipterocarpus alatus* Roxb.	Dipterocarpaceae	Kanyin-phyu	EN A1 cd +2cd, B1 +2c	Phalan old village near Thidarmyaing	N16° 38' 20.2" E96° 17' 26.7"

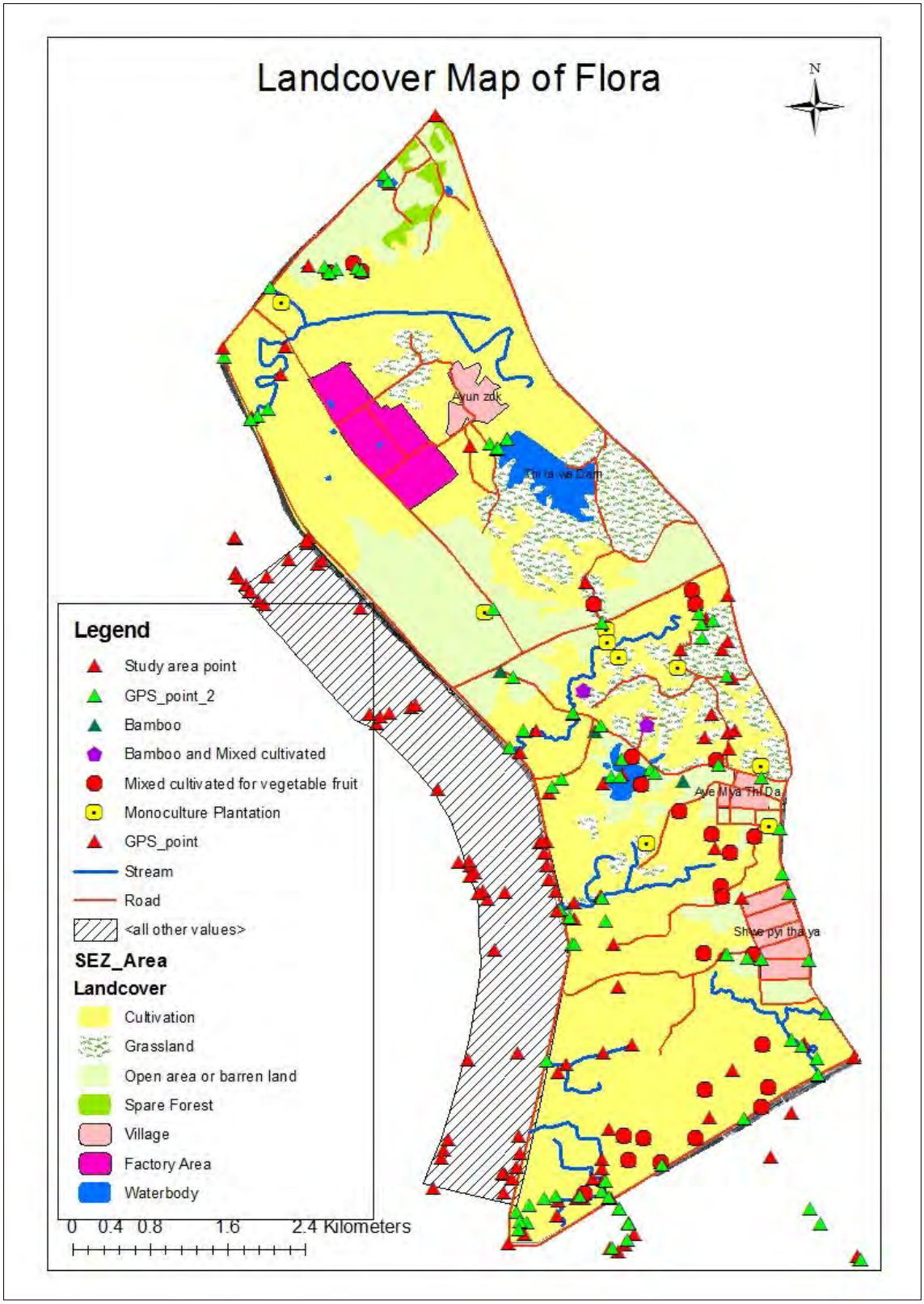
**Dalbergia cultrata* Grah. is listed in the World List of Threatened Trees as Endangered (A1cd).

Source: SEZ Management Committee study



Source: World Wildlife Fund

Figure 4-7 WWF Ecoregions of Myanmar



Source: SEZ Management Committee study

Figure 4-8 Area of Study and Landcover

As indicated in the landcover map above, almost all of the terrestrial ecosystem in the Project area is covered by agriculture lands. There are also monoculture plantations of

Acacia auriculiformis A.Cunn., and some bamboo patches as well as a mixed plantation of fruit trees like *Anacardium occidentale* L., found in large patches in the studied area. Ornamental flower cultivation in private orchards is also common in the Project area.

4.1.3 Social Environment

Thilawa SEZ overlaps both the Thanlyin and Kyauktan Townships south of Yangon with the northern half of the Project in Thanlyin and the southern half in Kyauktan. Thanlyin as a whole has an area of 143.982mi^2 (372.912km^2) with a population of 210,838 people in 2015. Kyauktan as a whole has an area of 325.76mi^2 (843.715km^2) with a population of 170,844 people in 2015[7]. In the Thilawa SEZ itself, there seems to be a number of households in the 2,000ha area of the SEZ with the highest population density in the northern area of the SEZ zone.[8] The ethnic make-up of the population is overwhelmingly Bamar (95%+) with Kayin, Rakhine, Indian and other smaller ethnicities also represented.[9] Income sources in the area are predominately income from casual labor, agricultural activities, and other trades such as fishery and skilled labor.

1) Cultural Heritage

Significant cultural heritage in the site itself was not identified. There are however significant cultural heritage assets around the Thilawa SEZ including numerous pagodas such as the Kyaik Kyauk Pagoda, monasteries, and the remnants of the ancient Mon kingdom of Pada Gyi located around the Pardagyi Pagoda. The Pada Gyi Kingdom was a so-called 'laterite' kingdom in that the principal building materials used were laterite. The Ministry of Culture confirmed that laterite in the region is mostly situated 15m+ above sea level and the ground at lower elevations is generally silty and inappropriate for the type of construction conducted by these 'laterite' kingdoms. Therefore, it is highly unlikely that any archaeological remnants of the Pada Gyi Kindgom exist directly in the 2,000ha SEZ area. However, it is thought that some archaeological remnants of the Pada Gyi Kingdom might be located proximate to the route leaving the Thilawa SEZ and going to Dagon Bridge.

2) Water Use

The Township Development Committees of Kyauktan and Thanlyin have responsibility for providing water in their respective areas. At present, water sources for Thilawa area are underground water and surface water which is stored by three water storage reservoirs: Zarmani, Thilawa, and Bant Bwekone in Thanlyin and Kyauktan Townships. The water rights for underground water belong to the Ministry of Development Affairs (MDA) and the rights to surface water belong to the Ministry of Agriculture and Irrigation (MOAI). Therefore, Zarmani and Bant Bwekone reservoirs are controlled by MOAI. However, the Thilawa Reservoir is managed by MOI and Ministry of Construction (MOC).

Presently Zarmani Reservoir is used mainly for irrigation purposes. Thilawa Reservoir is utilized for industrial and irrigation water. The water supply from the Thilawa Reservoir is purified at 2 purification plants and sent to the various industries and facilities around the Thilawa SEZ area. Likewise, the Bant Bwekone Reservoir supplies water to the ship breaking facility and to the Kyauktan area.

In addition to these surface water sources, there are also a number of groundwater wells

[7] General Administrative Department, Thanlyin, and General Administrative Department, Kyauktan

[8] JICA (2013b). Resettlement Work Plan (RWP) for Development of Phase 1 Area Thilawa Special Economic Zone (SEZ)

[9] JICA (2013). Preparatory Study on Thilawa Special Economic Zone (SEZ) Infrastructure Development in the Republic of the Union of Myanmar

found on site. Wells on site are used for both drinking water and miscellaneous domestic use.

3) Fisheries

There is commercial fishing activity around the mangrove-lined streams exiting the SEZ from the western border and emptying into the Yangon River, although technically it is prohibited by law to fish within 300m of mangrove forest, the mangroves around the zone are not classified as mangrove forest by the Forestry Department of the Ministry for Environmental Conservation and Forestry. Commercial fishing occurs in the main Yangon River to which the subsidiary streams flow. There are also artisan fishing activities around various man-made ponds within the SEZ. These communities include fishermen dependent on fisheries activities and aquatic products for income and food security. The fisheries depend on the mangroves that line the banks of the streams and the brackish tidal flows that characterize the water quality and content. It is also considered likely that these small streams might provide a spawning ground for larger fish in the greater Yangon River system.

4) Health

The disease prevalence as reported by the respective GADs of Thanlyin and Kyauktan is as follows.

Table 4-9 Disease Prevalence in Thanlyin and Kyauktan

Township	Disease Type											
	Malaria		Diarrhoea		Tuberculosis		Dysentery		Hepatitus		HIV / AIDS	
	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths
Thanlyin	11	-	1013	2	259	-	239	-	4	-	60 (2015) 63 (2014)	4 (2015) 2 (2014)
Kyauktan	5	-	728	-	258	-	471	-	14	-	10 (2015) 33 (2014)	0 (2015) 4 (2014)

Source: General Administrative Department, Thanlyin and Kyauktan

Table 4-10 Availability of Health Care

	Township	Name of Hospital / Health Facility	Type	Comment
1	Thanlyin	Thanlyin Hospital	Government hospital	200 beds
2	Thanlyin	Township Hospital	Government hospital	16 beds
3	Thanlyin	Chan Myae Myitta Hospital	Government hospital	20 beds
4	Thanlyin	Swan	Private clinic	General admission
5	Thanlyin	Aung (24) Hours	Private clinic	General admission
6	Thanlyin	Win	Private clinic	General admission
7	Thanlyin	Hlaing	Private clinic	General admission
8	Thanlyin	Myat Thukha	Private clinic	General admission
9	Thanlyin	Win Myittar	Private clinic	General admission
10	Thanlyin	Linn	Private clinic	General admission
11	Thanlyin	Kyaw	Private clinic	General admission
12	Thanlyin	That Thar Aung	Private clinic	General admission
13	Thanlyin	Aung Chann Myae	Private clinic	General admission
14	Thanlyin	San Mya Thidar	Private clinic	General admission
15	Thanlyin	Myitta Yait	Private clinic	General admission
16	Thanlyin	Kan Kaw Shwe Yee	Private clinic	General admission
17	Thanlyin	Moe	Private clinic	General admission
18	Thanlyin	Aung Thapyay	Private clinic	General admission
19	Thanlyin	Moe Thet	Private clinic	General admission
20	Thanlyin	Shwe Thet Lone	Private clinic	General admission
21	Thanlyin	Htet	Private clinic	General admission
22	Thanlyin	Myittar	Private clinic	General admission
23	Thanlyin	Taw Win	Private clinic	General admission

24	Thanlyin	Myitta Mon	Private clinic	General admission
25	Thanlyin	Aung	Private clinic	General admission
26	Thanlyin	Health Clinic	Private clinic	General admission
27	Thanlyin	Shwe	Private clinic	General admission
28	Thanlyin	Linn	Private clinic	General admission
29	Thanlyin	Nway Moe Saung	Private clinic	General admission
30	Thanlyin	Kyaw	Private clinic	General admission
31	Thanlyin	Parami	Private clinic	General admission
32	Thanlyin	Lamin	Private clinic	General admission
33	Thanlyin	Maristoke	Private clinic	General admission
34	Thanlyin	Free clinic	Private clinic	General admission
35	Thanlyin	Thitsar clinic	Private clinic	General admission
36	Thanlyin	Satku Yarzar	Private clinic	General admission
37	Thanlyin	Yuzana	Private clinic	General admission
38	Thanlyin	Family Care Fcc	Private clinic	General admission
39	Thanlyin	Linn Lat	Private clinic	General admission
40	Thanlyin	Aye Chan (24)	Private clinic	General admission
41	Thanlyin	Hlaing Myitta	Private clinic	General admission
42	Thanlyin	Lwin	Private clinic	General admission
43	Thanlyin	Laesar	Private clinic	General admission
44	Thanlyin	Han Thazin	Private clinic	General admission
45	Thanlyin	May	Private clinic	General admission
46	Thanlyin	Myat Thiri	Private clinic	General admission
47	Thanlyin	Depoler	Private clinic	General admission
48	Thanlyin	Diamond	Private clinic	General admission
49	Thanlyin	Lat Yat San	Rural health center	-
50	Thanlyin	Phayar Kone	Rural health center	-
51	Thanlyin	Kalar Wae	Rural health center	-
52	Thanlyin	Thapyay Kan	Rural health center	-
53	Thanlyin	Day Zat	Rural health center	-
54	Kyauktan	Kyauk Tan Hospital	Government hospital	25 beds
55	Kyauktan	Tatar Sub-township Hospital	Government hospital	16 beds
56	Kyauktan	Meepya Village Tract	Government hospital	16 beds
57	Kyauktan	Leprosy Clinic	Government clinic	Treatment of Leprosy
58	Kyauktan	Malaria Clinic	Government clinic	Treatment of Malaria
59	Kyauktan	Tuberculosis Clinic	Government clinic	Treatment of Tuberculosis
60	Kyauktan	Doctor Aung Clinic	Private clinic	General admission
61	Kyauktan	Doctor Kyi Htoo Clinic	Private clinic	General admission
62	Kyauktan	Athawka Clinic	Private clinic	General admission
63	Kyauktan	Doctor Tin Maung Thein Clinic	Private clinic	General admission
64	Kyauktan	Woman Affairs Association	Rural health center	-
65	Kyauktan	Tatar Sub-Township	Rural health center	-
66	Kyauktan	Meepya	Rural health center	-
67	Kyauktan	Mingalon	Rural health center	-
68	Kyauktan	Kyonekan	Rural health center	-
69	Kyauktan	Kamarkalote	Rural health center	-
70	Kyauktan	Potetalote	Rural health center	-
71	Kyauktan	Myaingtharyar	Rural health center	-
72	Kyauktan	Khanaung	Rural health center	-
73	Kyauktan	Shan Chaung	Rural health center	-

Source: General Administrative Department, Thanlyin and Kyauktan

According to the International HIV/AIDS Alliance there are a number of sexually transmitted disease (STD) and Human immunodeficiency virus / acquired immunodeficiency syndrome (HIV/AIDs) clinics/programs run by government organizations and NGOs that would be willing to establish activities during construction and project implementation to deal with the influx of workers to the area.

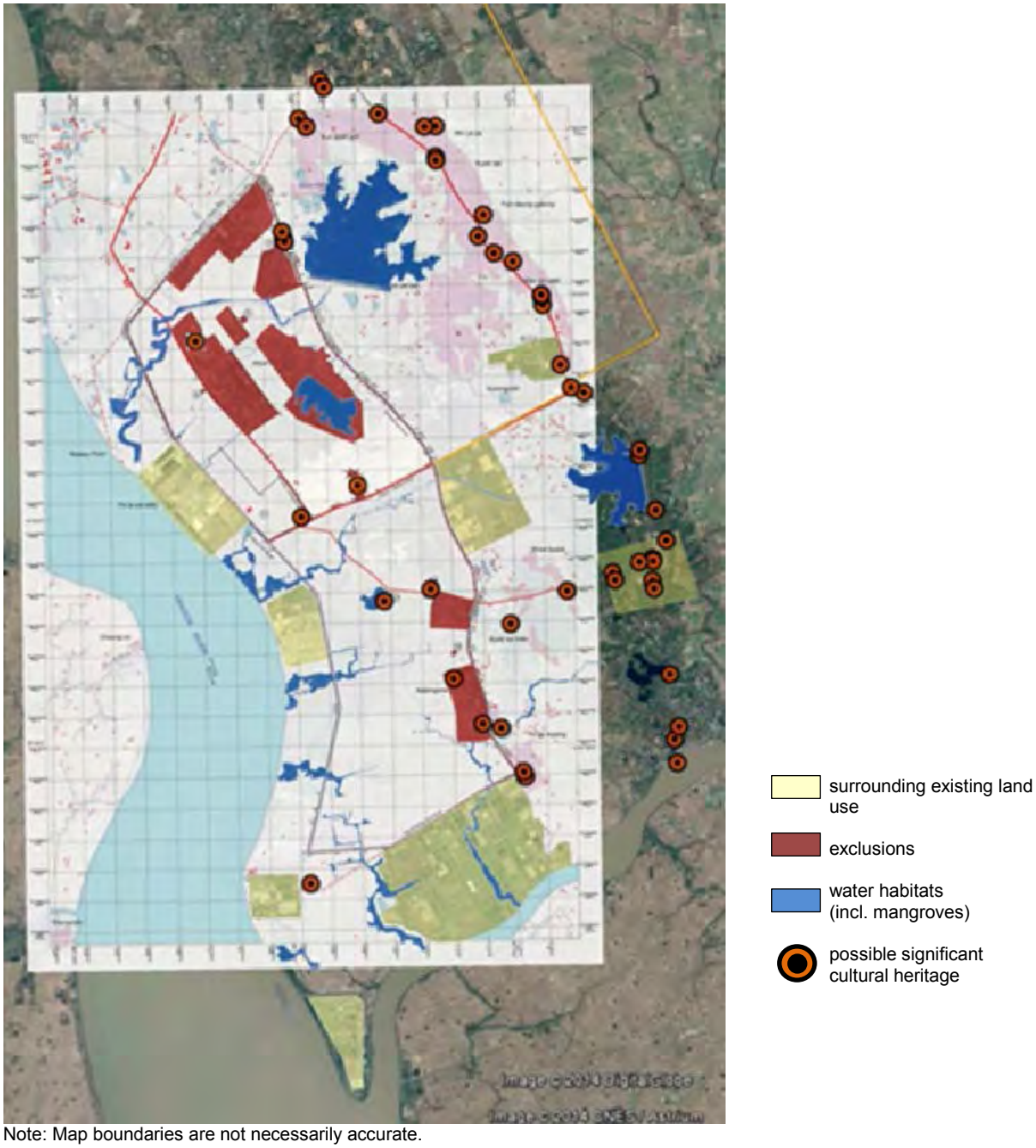
5) Transportation and Access

Waterways are used for transportation between the western area of the SEZ and the Yangon River villages. Foot and bullock cart paths crisscross the SEZ throughout to provide

access to homesteads, farmland, and social facilities. Motorized land vehicles use the dirt roads within the SEZ. Outside of the SEZ the two large bridges (Thanlyin Bridge and Dagon Bridge) that are currently used as the access points from the Thanlyin side of the Bago River to the Yangon City area.

4.1.4 Environmental Sensitivity

The following figure provides a summary of the potential socio-environmental sensitivities as described in the sections above.



Note: Map boundaries are not necessarily accurate.

Source: SEZ Management Committee using Google Earth imagery

Figure 4-9 Environmentally Sensitive Areas

5 Description of Project Alternatives

Project alternatives defined in this section represent different iterations of the development of the Project. The first alternative is a “Without Project” case. This involves projecting what is likely to occur if proposed investment projects are not undertaken and this case is meant to serve as a baseline that is equivalent to business-as-usual in the SEZ without development of the remaining 2,000 ha.

This case is used to compare the implemented versions under consideration: Alternative 1 and Alternative 2, presented thereafter. Both Alternative 1 and 2 consist of an SEZ that consists of mixed development of industrial, commercial, residential, and public space, with industrial zoning making up the majority of the area.

5.1 “Without Project” Case

The “Without Project” Case represents the case where there is no Thilawa SEZ 2,000ha development.

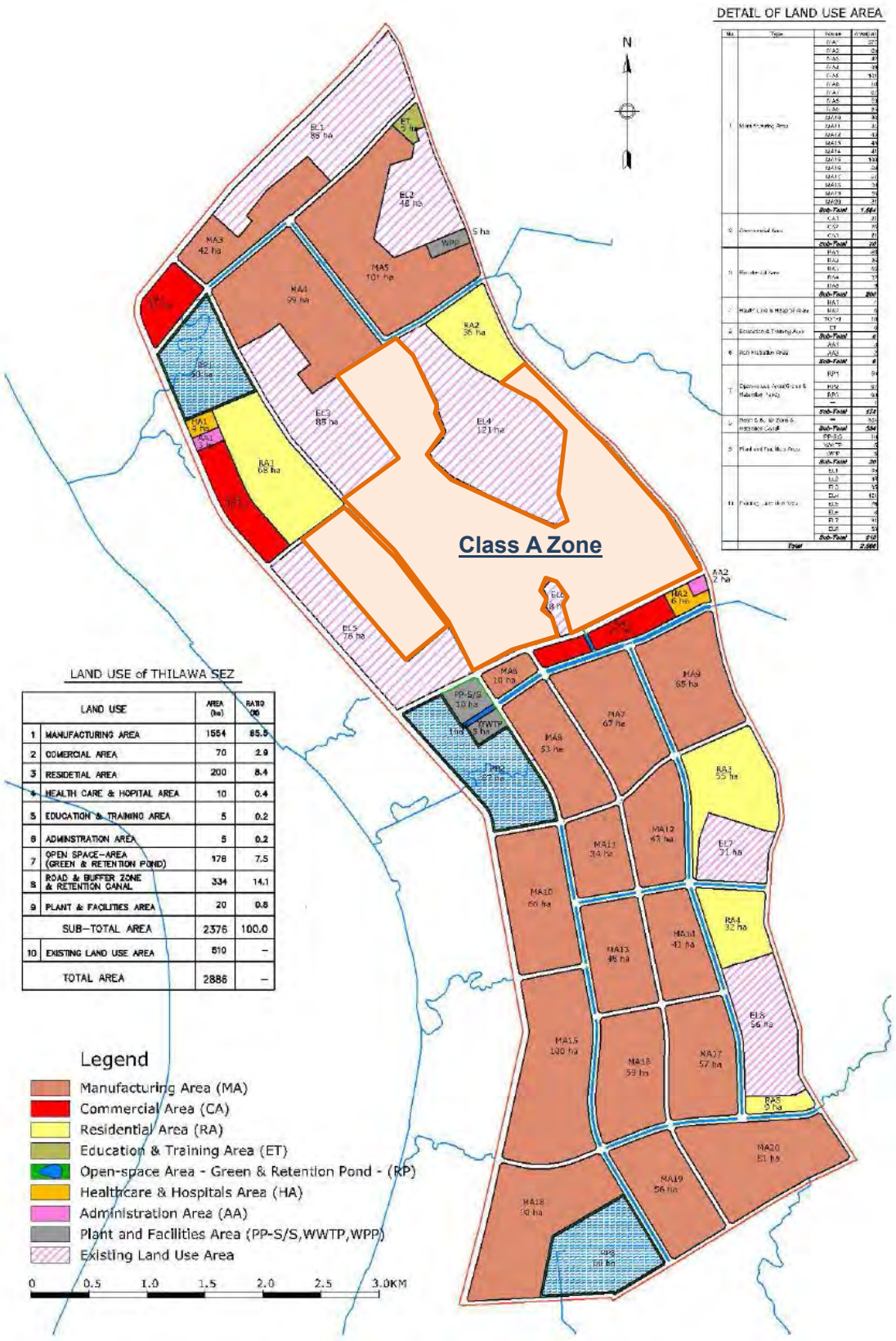
Myanmar is rapidly developing and demand forecasts have demonstrated high demand for industrial areas. It is necessary to meet that demand in an efficient and coordinated manner that meets economic needs while reducing impacts on the environmental and social issues. The best way to achieve this goal in a coordinated way is through an SEZ.

The land for the Thilawa SEZ 2,000ha development is situated in a flat area next to the Zone A area and is proximate to both the Thilawa Port and Yangon. The benefits for this area are an abundant labor force in Myanmar’s most populated area and accessibility to Yangon, the largest market in the country. The logistics benefits to having a port proximate to the SEZ makes it a very attractive place for foreign enterprise to establish manufacturing in Myanmar to develop industrial activities in Myanmar and provide good job opportunities for Yangon residents. Other than Thilawa, there are no places which have such conditions.

Ultimately, an SEZ provides an area where companies can coordinate private investment with provision of land and infrastructure that is well managed economically and environmentally. Without the additional 2,000ha, the Yangon region will not have enough industrial land capacity to meet the forecasted industrial demand. Since the demand is there, the result of a “without project” scenario would be uncoordinated land use as companies build to meet their business needs but without the support that an SEZ provides. This would in turn result in increasing strain on already poor infrastructure in the Yangon region. It is also likely that haphazard building of industrial facilities would result in sub-optimal creation of investment and job opportunities since more private sector resources would need to be spent on capital and operational costs instead of job creation. The SEZ is therefore the most environmentally and economically sound method for meeting industrial growth in the Yangon region.

5.2 Alternative 1 (Original Plan)

Alternative 1 is the alternative that has been approved on a bilateral basis between the relevant governmental parties of Myanmar and Japan. The land use plan of Alternative 1 is presented in the figure below.



Source: adapted from METI (2013) *Project for Promoting Export of Infrastructure System.*

Figure 5-1 Alternative 1 Land Use Plan

As is evident from the figure above, the land use plan of Alternative 1 consists of a prioritized

central area (Zone A area) that began construction in November of 2013. The 2,000ha Zone that is proposed in this Project will developed in four stages in the remainder of the colored area in the figure above and have in effect two industrial zones that are separated to the north and south of the Zone A.

Additionally, there are three retention ponds that are to be constructed in the northwest, central west, and southwest areas of the Thilawa SEZ in this alternative. In this alternative all streams would be normalized into the drainage systems of the SEZ. Treated sewage would be discharged into a stream before being ejected into the Yangon River.

Residential areas (in yellow) would be scattered about the northwest, northeast, and southeastern portions of the SEZ in between industrial areas.

This alternative would also backfill the southern pond next to a monastery.

Following the general master plan developed under this plan, it should be noted that the specific necessary exclusions were identified afterwards with a detailed land survey. Therefore, existing land use area (pink-stripes) have been updated to reflect the actual conditions on the ground based on Government Notification (No. 65/2013) that specifies excluded areas as described in Chapter1**.**. The amendment meets the original plan's goals while developing them in a more precise manner..

From environmental point of view, the following considerations could be taken to realize "environmentally friendly" development as in the Development Concept.

1) Preservation of natural streams and water surface within the project site; and

2) Preservation of cultural heritage within the project site.

5.3 Alternative 2 (Upgraded Plan)

The land use plan of Alternative 2 is more considerate of existing natural and social resources in the area and reflects exclusion zones decided since the initial conceptualization of Alternative 1 as well as the integration of ecologically and community friendly water areas are preservation of mangroves as proposed in the stakeholder meetings.

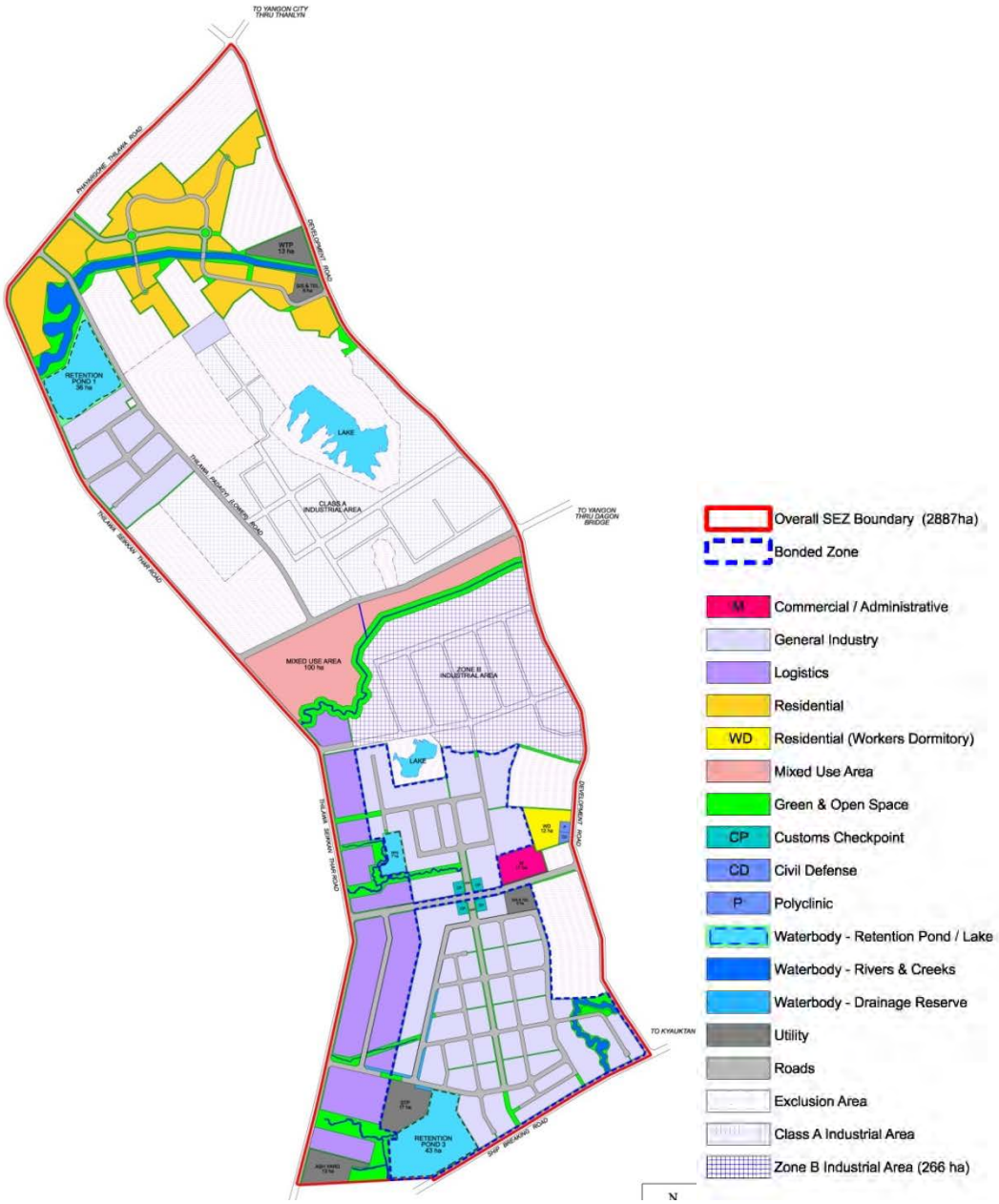


Figure 5-2 Alternative 2 Land Use Plan

Like Alternative 1, Alternative 2 reflects the master plan adopted by the Government of Myanmar and consists of the Zone A prioritized zone bordered to the north and south by the 2,000ha zone—that is, the present project.

Alternative 2 can be thought of a more socio-environmentally sensitive option to Alternative 1. Alternative 2 would seek to maintain natural streams and water surface including the freshwater pond next to the monastery in the middle, which will serve for conservation of birds, fish, and wildlife habitats. The main body of the streams running through the zone will be kept as-is with the aim to preserve water habitat, as far as is possible from a flood prevention standpoint.

The land use distribution is planned based on demand and minimization of backfilling operations during construction.

5.4 Comparison between Alternative 1 and 2

The following table summarizes the differences between Alternative1 (Original) and 2 (Upgraded). The major differences in environmental and social issues will be in the Natural Environment, Hydrology and Cultural Heritage as mentioned above. Major changes in the two land use plans are shown below.

1) Total Area:
   The total area was decreased due to the expanded exclusion zone and set asides for environmental and social facilities.
2) Common Area:
   Common area was increased due mainly to the preservation of existing creeks and a pond.
3) Commercial and residential areas:
   Commercial and Residential areas were decreased.

Because of the non-commercial benefits in achieving the ultimate goals of the SEZ as explained in Chapter 1, Alternative 2 is considered to be a more desirable alternative.

Table 5-1 Comparison between Alternative 1 and 2

Major Items		Alternative 1 (Original Plan)		Alternative 2 (Upgraded Plan)	
Land Use Plan	**Total Area**	**2,886ha**	**100.0%**	**2,887ha**	**100.0%**
	General Industries	1,554ha	53.8%	1,119ha	38.8%
	Logistics	0ha	0.0%	170ha	5.9%
	Residential (incl. dormitories)	200ha	6.9%	191ha	6.6%
	Commercial/ administrative	75ha	2.6%	11ha	0.4%
	Mixed use	0ha	0.0%	100ha	3.5%
	Roads	334ha	11.6%	261ha	9.0%
	Green space/ ponds	178ha	6.2%	301ha	10.4%
	Utility	20ha	0.7%	54ha	1.9%
	Other	15ha	0.5%	13ha	0.5%
	Excluded areas	510ha	17.7%	767ha	23.1%
Measures considered in the planning stage (As of April, 2014)		[Policy level] -Environmentally Friendly -Eco-Smart [Considerations in land use plan] -Retention Ponds -WWTP		[Policy level(Draft)] -Environmentally Friendly -Eco-Smart [Considerations in land use plan] -Retention Ponds -Natural Streams -Water Surface (Pond) -Use of greenery -WWTP -Cultural Assets	
Pollution Control					
Air/Noise/Vibration/odor/Soil		There might be some impacts regarding those items, which should be controlled by each tenant under the supervision of a one-stop service center.			
Water		Wastewater will be collected and treated at WWTP.			
Ground Subsidence		Underground water use for public water supply is not planned during operation, but groundwater might be used during construction or operation for various purposes.			

Natural Environment		
Protected Area	There is no protected area within and around the project site.	
Ecosystem	There is a risk of Mangrove habitat (Water streams)	Mangrove habitats (Water streams) will remain. One pond located next to the monastery in the center of the project site will remain.
Hydrology(Flood Control)	Three Retention ponds are to be constructed. Main streams will be altered to concrete water channel.	Three Retention ponds are to be constructed. Main streams will be expanded to allow more flow rate, keeping the current routes.
Topography and Geology	The area is generally flat without any distinctive geologic features.	
Social Environment		
Resettlement	There are settlers who live in the project site and need relocation.	
Livelihood	There are settlers who live within or outside the project site making their living by selling goods and/or doing commercial, agriculture, factory worker, and subsistence fishing.	
Cultural Heritage	There is a risk of Cultural Heritage.	Cultural Assets are avoided and kept as it is based on the relevant laws and regulations.
Indigenous People	There are no indigenous people.	

6 Environmental Studies

In order to gauge the magnitude of impacts, the studies as described in the table below have been or are being developed as a part of EIA.

Table 6-1 Investigation of Environmental Impact Assessment

Category	Item	Survey Item	Survey Method	Quantity
Pollution Control	Air Quality	Local pollutant indicators: NO_2/NO_x, SO_2, CO, SPM, PM10	Air quality measurement by instrument	6 locations, 2 days/time, 2 times per year (both rainy and dry season)
	Water Quality	Surface water: Temperature*, flow rate*, odor*, color*, electrical conductivity*, pH*, BOD5*, SS*, DO*, total coliform, COD, total nitrogen, total phosphorous, oil and grease, turbidity, arsenic (As), mercury (Hg), lead (Pb), cadmium (Cd), hexavalent chromium (Cr(VI)), copper (Cu), zinc (Zn), nickel (Ni), iron (Fe), cyanide (CN) Underground water: Temperature*, odor*, color*, electrical conductivity*, hardness, pH*, arsenic (As), mercury (Hg), led (Pb), cadmium (Cd), hexavalent chromium (Cr(VI)), copper (Cu), zinc (Zn), nickel (Ni), iron (Fe), cyanide (CN), oil and grease, fluoride, nitrates (NO_3-N, NO_2-N), ammonium nitrogen (NH_4-N), total coliform, water level*	Sampling and measurement by field equipment and laboratory analysis	Surface water: 6 locations, 2 times (both rainy season and dry season). Asterisked items are measured monthly at the 6 locations. Underground water: 3 locations, 2 times (both rainy season and dry season). Asterisked items are measured monthly at the 3 locations.
	Waste	Amounts of construction waste, amount of operational (industrial/household) waste, location/method for final disposal, capacity for final disposal, responsible authority for waste disposal	Interviews with relevant authorities, reference to construction planning data.	N/A
	Soil Contamination	Mercury (Hg), arsenic (As), lead (Pb), cadmium (Cd), copper (Cu), zinc (Zn), hexavalent chromium (Cr(VI))	Sampling and measurement by laboratory analysis	1 time, 2 locations
	Noise &Vibration	Traffic volume, noise level	Vehicle survey and noise survey	Vehicle survey: 2 intersections and 2 road sections Noise survey: 24 hr continuous monitoring in 6 locations @15-20 seconds/record
	Land Subsidence	Construction water demand	Interviews with relevant authorities Possible water sources in and around the project site.	N/A
	Offensive Odor	Identification of potential sources and receptors in and around the site (residences, social infrastructure, etc.)	Examination of possible odor sources and vectors through the interviews	N/A
	Sediment	Engineering and construction plans for 2,000 ha site.	Confirmation of engineering and construction plans	N/A
Natural Environment	Protected Area	Nationally and internationally important areas in terms of flora, fauna, cultural heritage, etc.	Identification of protected areas in and around the site	N/A
	Ecosystem	Water and land ecosystems on the site	Flora/Fauna (mammal, bird, reptile, fish, amphibian, plants/tress)	Flora and Fauna survey conducted once during dry

Category	Item	Survey Item	Survey Method	Quantity
			survey, site walk, identification of sensitive habitats in and around site	season and once during rainy season
	Hydrology	Surface and underground hydrology	Confirmation of Construction and water course engineering plans and plans for operational water provision	N/A
	Topography and Geology	Elevation and geology in and around site	Boring study on a 100ha basis throughout the remaining 2,000ha area.	20 boreholes every 100ha.
Social Environment	Involuntary Resettlement	Location and number of people in existing households within the 2,000 ha area that are to be moved	Resettlement Work Plan (RWP) (performed separately from the present document)	N/A
	Impacts on the Poor	Status of the living situation of the poor as well as integration opportunities with the new SEZ	Review of social statistics applicable to the area, reference to RWP-related documentation, interviews with local persons, host communities will be surveyed for consideration of impacts of inward migration	N/A
	Ethnic Minorities and Indigenous Peoples	Status of ethnic minorities and indigenous persons in the site	Review of social statistics applicable to the area, interviews with local persons	N/A
	Living and Livelihood	Status of major livelihoods in the area	Review of social statistics applicable to the area, interviews with local persons	N/A
	Land use and use of local resources	Status of current and future land use including availability and access to resources such as land, roads, aquatic, and water	Examination of land use plans, evaluation of current local resource use through interviews with local persons, reference to the RWP	N/A
	Water availability	The sustainability of and access to water resources	Examination of water use plans in the construction and operation phases	N/A
	Existing social infrastructure and services	Identification of social infrastructure including community centers, education, health and religious facilities	Field survey and information available from project resources	N/A
	Uneven distribution of benefits and damages	Socio-economic status of local people and potential changes as a result of the project	Field survey interviews with local persons, reference to the RWP	N/A
	Conflict of interest in the area	General investigation of potential conflicts of interest in project operation and implementation	N/A	N/A
	Cultural Heritage	Identification of cultural heritage in and around the site	Field survey, interviews with government officials, reference to historical documents	Conducting 1 field survey to verify findings in documentation.
	Landscape	Identification of landscape impacts	Field survey	N/A
	Gender	Identification of impacts on gender equality	Review of gender statistics by industry	N/A
	Children's Rights	Identification of child vulnerabilities as a result of this project	Review of Myanmar law implementation, data and info by UNICEF and other experts	N/A

Category	Item	Survey Item	Survey Method	Quantity
	Infectious Disease such as HIV/AIDS	Identification of prevalence and potential spread of infectious disease as a result of project construction and operation	Review of infectious disease statistics and HIV/AIDs related activities in the area during construction and plans after operations commence.	N/A
	Working conditions (including occupational safety)	Issues surrounding working conditions including non-compliance with international and national conventions and laws and occupational safety	Review of laws and regulations applicable to the project	N/A
	Accidents	Probability of increased accidents on site	Confirmation of engineering plans for pedestrian and motorways	N/A
	Transboundary impacts or Climate Change	Identification of possible sources of GHGs as a result of project implementation	Documentary review	N/A

7 Public Consultation

7.1 Preliminary Meetings with Stakeholders

Preliminary meetings with NGOs, private companies and relevant government authorities were conducted to understand the current environmental and social issues in Myanmar. . The major findings are as summarized in the tables below.

Table 7-1 Record of Significant Meetings During Initial Stakeholder Consultations

Date	Stakeholder Representation	Nature of Consultation
07 October 2013	ECODev (Environmental NGO)	• Explanation of TOR and project • Recommendations for laboratory analysis of water and soil samples • Natural environment issues
08 October 2013	Friends of Wildlife (Environmental NGO)	• Explanation of project • Forestry Law • Protected Areas Law • Species conservation regulations • Biodiversity in Thilawa
09 October 2013	FREDA (Environmental NGO)	• Explanation of TOR and project • Mangrove issues in the Thilawa area
09 October 2013	Swanyee Foundation (Environmental NGO)	• Explanation of TOR and project • Environmental and social policy in Myanmar • Mangrove issues in the Thilawa area • Livelihood issues in the Thilawa area
10 October 2013	Myanmar Centre for Responsible Business (Environmental NGO)	• Explanation of project • General EIA issues
11 October 2013	HIV/AIDS Alliance (Social NGO)	• Explanation of project • HIV/AIDS issues in Myanmar • Infectious disease prevention measures
28 November 2013	Ministry of Environmental Conservation and Forestry, Environmental Conservation Department, Yangon Region	• Explanation of project • EIA Guidelines • Capacity building activities in the context of this project
29 November 2013	Yangon University, Archaeological Department	• Explanation of project • Cultural heritage issues in Thilawa
02 December 2013	General Administrative Department of Thanlyin and Kyauktan	• Explanation of project • Methods for sampling in the area • Stakeholder meeting issues • Improved list of relevant government stakeholders
02 December 2013	Yangon University, Archaeological Department Ministry of Culture, Department of Historical Research	• Cultural heritage issues in Thilawa • Identification of cultural heritage sites
02 December 2013	YCDC, Pollution Control Department	• Explanation of project • Environmental standards in the Yangon Region • Solid waste management issues
03 December 2013	Myanmar Bird and Nature Society (Environmental NGO)	• Explanation of project • Ornithology data in Thilawa • Discussed important birds
04 December 2013	Ministry of Environmental Conservation and Forestry, Pollution Control Division	• Explanation of project • Environmental standards in Myanmar • Potential new environmental standard development
04 December 2013	Ministry of Environmental Conservation and Forestry, Environmental Conservation Department	• Explanation of project • Draft EIA Guidelines
05 December 2013	Settlement and Land Record Dept. (Thanlylin township) Agricultural Dept. (Thanlyin Township) Fishery and Livestock Department Let Yet San Rual Health Centre	• Explanation of project

Date	Stakeholder Representation	Nature of Consultation
	(Thalyin township) Settlement and Land Record Dept. (Kyauktan township) Health Department (Kyauktan township) Agricultural Department (Thanlyin township) General Administrative Dept. (Thanlyin township) General Administrative Dept. (Kyauktan township) Planning Dept. (Thanlyin township) Immigration Dept. (Kyauktan township) Housing Department Military Security Water Ways Dept. Myanmar Port Authority	
05 December 2013	Myanmar Centre for Responsible Business (Environmental NGO)	• Explanation of project • Draft EIA Guidelines • Coordination of activities with other donors • Development of SEA • Stakeholder communication
11 December 2013	ADB Environmental Specialist for Environmental Standards	• Environmental standard setting in Myanmar
05 March 2014	Glass factory on site	• Explanation of project
05 March 2014	Galvanized roofing factory on site	• Explanation of project • Current environmental management practices in Thilawa
05 March 2014	Thanlyin Waste Collection Department	• Explanation of project • Waste collection and disposal practices in Thilawa area
06 March 2014	Myanmar Development Resources Institute (NGO)	• Explanation of TOR and project • SEA development • Stakeholder involvement
06 March 2014	Ministry of Environmental Conservation and Forestry, Environmental Conservation Department, Yangon Region	• New SEZ Law and Foreign Investment Law • Draft EIA Guidelines
06 March 2014	Ministry of Environmental Conservation and Forestry, Forest Department, Yangon Region	• Mangrove issues • Protected species issues
07 March 2014	Mingaladon Industrial Park	• Explanation of project • Environmental management practices in Myanmar
30 June 2014	SEA Stakeholder Meeting	• 353 attendees (93 government officials, 229 local persons, and 31 members of the media) • Presentation led by SEZ Management Committee • Contents of the presentation included a technical presentation of SEA methodology, the legal and environmental framework of the project in Myanmar, and construction and operational scenario planning issues.
24 November 2014	Mercy Corp	• Information about Mercy Corp's activities in Myanmar • Information sharing about the Thilawa SEZ development
26 November 2014	Myanmar Japan Thilawa Development (MJTD)	• Discussed how to harmonize the development of Zone A and the remaining SEZ area. • Discussed harmonizing wastewater processing and standards
26 January 2015	Myanmar Centre for Responsible Business (Environmental NGO)	• Discussed environmental management institutional structures for the SEZ. • Discussed stakeholder engagement processes.
28 January 2015	MJTD	• Discussed implementation issues • Discussed environmental standard implementation • Discussed solid waste handling issues
30 January 2015	YCDC	• Discussed solid waste handling issues
13 February	Boring Survey Explanatory Meeting	• Explain about the boring survey to affected persons

Date	Stakeholder Representation	Nature of Consultation
2015		• Explain about accessibility and safety issues in conducting a boring survey in order to reduce harm to local persons.
26 August 2015	SEA Stakeholder Meeting	• 292 attendees (including 51 government officials, 196 local persons, 15 members of NGOs and 25 members of the media) • Presentation led by SEZ Management Committee • Contents of the presentation included summary of the draft SEA with alternative analysis, possible impacts and environmental management scheme.

Table 7-2 Comments from Stakeholders during Initial Consultation

Topic	Comment
General	• Essential to hold stakeholder meetings in an open and forthright manner with proper notice. • The project should have 5 stakeholder meetings. • Necessary to involve media in stakeholder meetings. • Environmental standards are being decided under the Science and Technology Technical Standards Committee under the 19th subcommittee for Environmental Quality Standards. ADB is assisting with this activity. • Ambient standards would initially be based on regional good practice and then revised to reflect country context. New industry would be expected to comply with interim ambient standards. • Draft EIA Guidelines from ECD should be followed. • Lessons should be learned from the poor stakeholder consultation process at the Letpadaung copper mine. • SEZ Law exempts each individual factory from undertaking an EIA process separate to the SEZ as a whole. • Zones should be established in the SEZ by factory type. • Construction inspector should be involved in factory development to ensure each factory follows regulations. • Differences between SEA and EIA. • All documents should be disclosed to the local people at the same time they are disclosed to authorities. • Local people should be able to participate in environmental surveys. • International rules and regulations should be strictly abided by. • Request for environmental education to better understand the implications of the SEA and EIA documents
Air Quality	• Air emissions monitoring is generally difficult in Myanmar due to lack of equipment. • Environmental parameters should be set to, at a minimum, IFC standards. • Myanmar domestic parameters will be implemented by type in the next years. Wastewater will be first followed by others. It will be necessary for applicable facilities to adhere to these domestic standards once established.
Water Quality	• Environmental parameters should be set to, at a minimum, IFC standards. • Myanmar domestic parameters will be implemented by type in the next years. Wastewater will be first followed by others. It will be necessary for applicable facilities to adhere to these domestic standards once established. • Yangon only has 5 environmental parameters items for wastewater that they implement. They do not really have very strict standards. • Wastewater on the site is currently infiltrated to the ground in some factories. • Water is supplied to military factories cheaply. • How wastewater will be treated. • Water resources should be secured for local persons since they rely on these sources for drinking and farming.
Waste	• There will be new solid waste processing facilities for Thilawa. • There will be a new incinerator with a 100 ton/day capacity for industrial hazardous waste. • There will be 2 new landfills, one of 30 acres (land already purchased) and one of 200 acres (land not yet purchased). • Waste is currently collected in the Thanlyin area with 5 vehicles each collecting 1 ton/day. • There is one surface landfill site at Ngapa serving Thanlyin.
Soil Contamination	• Environmental parameters should be set to, at a minimum, IFC standards. • Myanmar domestic parameters will be implemented by type in the next years. Wastewater will be first followed by others. It will be necessary for applicable facilities to adhere to these domestic standards once established.
Noise &Vibration	• Environmental parameters should be set to, at a minimum, IFC standards.

Topic	Comment
	• Myanmar domestic parameters will be implemented by type in the next years. Wastewater will be first followed by others. It will be necessary for applicable facilities to adhere to these domestic standards once established.
Land Subsidence	• No comment
Offensive Odor	• Environmental parameters should be set to, at a minimum, IFC standards. • Myanmar domestic parameters will be implemented by type in the next years. Wastewater will be first followed by others. It will be necessary for applicable facilities to adhere to these domestic standards once established.
Sediment	• No comment
Protected Area	• There are no formally protected areas such as national parks or forest areas in the site. • The mangroves on the site are not legally protected as forested areas. However, it is necessary to maintain the mangrove areas to preserve biodiversity. Particularly as habitats for protected bird species. • Necessary to maintain water areas in the southern pond area next to a monastery to preserve bird habitat.
Ecosystem	• Very little biodiversity data in Thilawa. • Land mostly converted to agriculture, so very little native habitat left. • There are no endangered species of birds in Thilawa. • However there are some endangered migratory species in areas of Myanmar south of Thilawa (about 100km) in Martaban including the Spoon billed sandpiper and other shore birds. The spoon billed sandpiper flies from Siberia. • In Ledkokegone there are gulls, Caspian terns, Little Terns, etc. • They expressed the desire to improve conservation efforts through Thilawa. • In Myanmar there are 1,096 species of birds identified, there were 2 species newly identified in 2013. • There are no threatened species in Thilawa, but the white-throated babbler is an important endemic species. • Desire to carry out conservation activities as part of the Thilawa development. • Wish to have a biodiversity management plan at the operational stage.
Hydrology	• Need to maintain all creeks to prevent flooding.
Topography and Geology	• The area is made up of silty soil and not of laterite. • Ministry of Construction has a topographic survey of the 2,000 ha area.
Involuntary Resettlement	• Involuntary resettlement issues are difficult in Thilawa and stakeholder considerations need to be taken into account early and with great care. • International standards should be followed in resettlement activities.
Impacts on the Poor	• Need to consider carefully resettlement issues as impacts to poor could be great.
Ethnic Minorities and Indigenous Peoples	• No comment
Living and Livelihood	• Livelihood assistance will be required after project is implemented. • Potential possibility to do livelihood development through mangrove conservation through micro grants for income substitution activities. • Employment and training opportunities should be reserved for local persons in new industries coming to the area.
Land use and use of local resources	• No comment
Water availability	• Water availability issues need to be coordinated in an effective manner. • Not possible to drill new tube wells in the area or the underground water will become brackish. Might be possible to drill tube wells from nearby locations. • The Bant Bwe Gone dam is supplying water to the Kyaikyauk area as well as the ship breaking area. • Water supply is the responsibility of the YCDC and Ministry of Irrigation/Ministry of Agriculture.
Existing social infrastructure and services	• Necessary to provide proper and sufficient educational facilities within the site and for resettled persons. • Need to make sure that health services are provided and improved in the area. • Transportation to and from Yangon City proper needs to be established through a multimodal transport system.
Uneven distribution of benefits and damages	• No comment
Conflict of interest in the area	• No comment
Cultural Heritage	• The riverine geology in that area of Myanmar from 0-25ft (0-7.62m) above sea level is “new alluvial” (less than 10,000 years old silt deposit), 25-50ft (7.62-15.24m) above sea level is “old alluvial” (meaning more than 10,000 years old silt), and anything greater than 50ft (15.24m+) above sea level is generally laterite.

Topic	Comment
	• The ancient kingdom of Pada Gyi was a laterite kingdom that used laterite as their principal building material. • According to previous geological surveys of the Thilawa area, there is not much laterite apart from some ridges on the border of Thanlyin and Kyauktan townships and this is not proximate to the assumed boundaries of the Pada Gyi kingdom. • It is very unlikely that there are archaeological assets related to the Pada Gyi kingdom on the site. • The known locations are not close to the main roads and areas of the site, so it is thought that the impact to ancient cultural assets is unlikely if construction and traffic is focused on the main road leaving the middle eastern portion of the site and continuing left to Dagon bridge.
Landscape	• No comment
Gender	• No comment
Children's Rights	• No comment
Infectious Disease such as HIV/AIDS	• Construction workers might be highly vulnerable to HIV/AIDS • Population Services International (PSI) gives free condoms. PSI also provides an STD/communicable disease (malaria/TB/etc.) clinic called "Sun Clinics". These clinics are preferred by most to the national clinics usually. • National AIDS Program (NAP), part of the Department of Health within the Ministry of Health. NAP has STD clinics around the country and in Thanlyin. NAP also provides AIDS counseling and testing (counseling is always given before testing in Myanmar to prevent suicide in case of a positive result). NAP gives anti-retrovirals for free. • Myanmar Business Coalition – provides businesses education on AIDS awareness to reduce stigma of AIDS. • AZG (the Netherlands Branch of Medicins Sans Frontieres) – provides some assistance to HIV/AIDS patients for transportation and nutrition supplements. • Mentioned that there is a Marie Stopes International Clinic in Thanlyin that provides women's health and HIV testing. Appropriate contact point for sex worker. • JOICFP is a Japanese organization working for family planning and HIV/AIDS • Mentioned that you have to register any HIV/AIDS clinic that you open. • Worth it to also provide services for Hepatitis B/C • UMFCCI (Chamber of Commerce) is interested in HIV/AIDS prevention
Working conditions (including occupational safety)	• Poor safety standards at existing factories in the Thilawa area.
Accidents	• Fire breaks should be established between factories through proper building regulation.
Transboundary impacts or Climate Change	• No comment

7.2 SEA Stakeholder Meeting (1)

The first official stakeholder meeting for the SEA was held on 30 June 2014. The purpose of the meeting was to introduce the planned SEA study to the public and to obtain the people's understanding and opinions on the study. The meeting was held at the temporary office of SEZ Management Committee, Branch Office of Land Use(2), Department of Human Settlement and Housing Development (Thanlyin) from 10.00am till 12.45pm. In total 354 persons participated, including government officials, private companies, and project affected peoples. Presentation materials, notifications and list of attendees are presented in Appendix A.

7.2.1 Announcement

Public announcements were made in two newspapers that are distributed throughout Myanmar. The language of the announcement was Myanmar. For English speaking NGOs, a separate English invitation letter was distributed via email. The two newspapers were Myanma Alin Daily and The Mirror.

Additionally announcements were made through the local General Administrative Departments (GAD) to concerned villagers, including the Thilawa Social Development Group.

7.2.2 Presentation Reference Materials

Materials, in this case the presentation, were provided upon request to participants.

7.2.3 Transportation

As a rural area, there are no appropriate venues available directly in the zone. The venue used was the Temporary Office of the SEZ Management Committee, which is roughly 1km to the East-Northeast of the SEZ area on the Thilawa/Dagon road cutting through the middle of the SEZ area from the port and going onto Dagon Bridge. To ease access to this venue, transportation options were provided to stakeholders.

1. From Yangon: A bus and van were provided from Yangon. Roughly 50-60 persons were transported in this manner from Yangon.

2. From Thanlyin and Kyauktan: 6 buses (3 for Thanlyin and 3 for Kyauktan) were provided to ease access for villagers. About 30-40 people per bus.

7.2.4 Record of Discussion

1. Representative of Alwan Sut Village, Thilawa Social Development Group first asked about the difference between EIA and SEA terms and methods for controlling air and water pollution from the zone if they exceed the standards. The Consultant Team responded that the implementation of a regional policy and plan is called an SEA and the plan for pollution control is called an environmental management plan (EMP), which will be discussed later on in detail in the presentation. Regarding penalties, they will be enacted in compliance with laws for pollution emission in addition of monitoring the natural environment of the zone and surrounding area by expert groups on an ongoing basis. Following this, the questioner asked about the wastewater discharges into the river noting that "since there are 6 streams in the designated zone and all empty into the Yangon River, he wants to know the methods for handling wastewater effluent from industries including whether there will be a treatment system or not". The Consultant Team answered that there is a plan to construct a wastewater treatment plant before discharging into the river or streams with potential use of grey water for landscape irrigation.

2. Representative of Thida Myaing village made an inquiry about health services plan for the affected local people that may become necessary due to potential pollution from the industries. The Consultant Team replied that baseline data of local air and water quality are being collected at present.

3. Representative of Myanmar Bird and Nature Society stressed the importance of the Consultant Team recommendation to use wetland technology. He also suggested including a biodiversity management plan in the EMP to prevent degradation of mangrove habitat.

4. Rector of Myanmar Maritime University asked about the development of a multimodal transport system in the region. TSEZMC explained that there has a plan to extend the road from Thanlyin bridge to the zone with a Japanese loan however the development of multimodal transport system requires the agreement of several ministries and departments. The Consultant Team added that currently Ministry of Construction is conducting the master plan to upgrade the roads. Then, the questioner quizzed about the employment opportunity for local people at the zone. The speaker responded that since this is one of the most important issues for the project, the SEZ Management Committee has another dedicated team assisting to conduct baseline data collection in tandem with the ongoing RAP. The Consultant Team requested to the guests to give suggestions and comments upon the project.

5. Representative of Shwe Pyouk Village requested to disclose the survey report to local people at the same time of submitting to the authorities. He then asked how stakeholders would know whether the report represents the true situation or not. Moreover, he asked that the Consultant Team allow local people participation in conducting the surveying and monitoring in order to ensure that the report is prepared according to international standards. The Consultant Team replied that civil society and independent organizations are warmly welcome to monitor and review the report and activities. Then Representative of Alwan Sut Village, Thilawa Social Development Group) requested the Consultant Team to carry out the project by strictly abiding to rules and regulations as a third party.

6. Representative of Yangon regional parliament expressed his worries relating to the hydrological pattern of six streams and three creeks (*sic)* including in the zone and appealed to manage these water sources properly since many people are relying on those resources. Moreover, he asked about employment opportunities for local people in new industries since most are very poor and have a low level of education. The Consultant Team responded that “we are planning to hold a meeting with Department of Water Resources and Improvement of River System of Ministry of Transport and Irrigation Department of Ministry of Agriculture and Irrigation to find the most appropriate way to deal with the water body issues and we also have a plan to meet local people to understand the real situation of those streams and creeks during the pre-construction phase”. Concerning employment opportunities, TSEZMC explained that the SEZ Management Committee will choose business types to operate in the economic zone while prioritizing those that bring in good employment opportunities. Moreover, there is an arrangement to offer vocational training to improve local human resources.

7. Consequently, the representative of Thida Myaing village asked about the international standards and the Consultant Team explained about the different effluent quality standards which are currently being considered for the 2,000ha area, including those of the Ministry of Mining, Ministry of Electrical Power, Ministry of Industry, and the Yangon City Development Committee (YCDC). The Consultant Team mentioned that international standards such as WHO, China and IFC guidelines are also being

considered to create the most appropriate pollution control mechanisms for the area.

8. Representative of Save the Children, NGO, questioned about the social impact standard and compensation for the involuntary resettlement according to the international standards. Moreover, he urged the SEZ Management Committee to perform transparent project activities. The Consultant Team clarified that there is another study team focusing on the assessment of social impacts for this project. Therefore they will respond to questions regarding to involuntary resettlement issues at their meeting.

The comments and the response within the SEA are summarized in the table below.

Table 7-3 SEA Stakeholder Meeting (1) Comments and Response

	Commenter	Comment received	Response
1	Representative of Alwan Sut Village, Thilawa Social Development Group	• The difference between EIA and SEA. • Methods for controlling air and water pollution from the zone if they exceed the standards and wastewater discharges into the river.	• Explained the difference between an EIA and an SEA at the stakeholder meeting, and provided explanation of what an SEA should be was added in Chapter 2 of this report. • Explained the basic concept of wastewater treatment at the stakeholder meeting and also added a detailed explanation in Section 4.1.1, above.
2	Representative of Thida Myaing village	• Health services plan for the affected local people.	• Conferred with infectious disease experts such as the International HIV/AIDS Alliance to understand the appropriate mitigation measures for health issues in the area post construction. As outlined in Section 4.1.3, above, there are a number of clinics available in the area to deal with infectious disease issues and the capacity of these will be analyzed further in the EIA.
3	Myanmar Bird and Nature Society	• Need to use wetland technology. • Including a biodiversity management plan in the EMP	• As explained in the presentation, the creeks will be left as is to the extent that it is possible. Where creeks require widening, the creeks will be widened only on one side and left as-is to prevent mangrove habitat degradation. The widened side will replant mangroves after widening works are completed. • As explained at the stakeholder meeting, a biodiversity management plan will be included as part of the EIA.
4	Rector of Myanmar Maritime University	• Development of a multimodal transport system in the region. • Asked about the employment opportunities for local people	• This project is one of many ongoing projects in the region and will be part of the Yangon Transport Master Plan. Dr. Than Than Thwe

		at the zone.	discussed the general plans at that point regarding transport options in the region. Including the expansion of a road from the SEZ area to Thanlyin Bridge. A further section was added to the SEA in Section 4.1.3, above. • At the meeting, Dr. Than Than Thwe responded that since this is one of the most important issues for the project, the SEZ Management Committee has another dedicated survey team assisting to conduct baseline data collection in tandem with the ongoing RAP. The results of that survey will be included in the EIA as part of the social data.
5	Representative of Shwe Pyouk Village Representative of Alwan Sut Village, Thilawa Social Development Group	• Request to disclose the survey report to local people at the same time of submitting to the authorities. • How would stakeholders know whether the report represents the true situation or not. Moreover, he asked that local people should participate in conducting the surveying and monitoring in order to ensure that the report is prepared according to international standards.	• The timing of the final report submission to government authorities is the same as the publication on the internet and distribution of paper copies at the GAD offices in Thanlyin and Kyauktan. • The local people have been consulted for surveys such as the boring survey beforehand so that they understand what kind of survey they will do and the timing. The local persons are welcome to comment during the development of the surveys and survey reports.
6	Representative of Yangon regional parliament	• Expressed worries relating to the hydrological pattern of six streams in the zone and appealed to manage these water sources properly since many people are relying on those resources. • Training opportunities for local people in new industries since most are very poor and have a low level of education.	• In the final version of the proposed land use plan, all 6 creeks will be kept as is where possible or expanded in an ecological way. • Concerning employment opportunities, Dr. Than Than Thwe explained that the SEZ Management Committee will choose business types to operate in the economic zone while prioritizing those that bring in good employment opportunities. Moreover, there is an arrangement to offer vocational training to improve local human resources.
7	Representative of Thida Myaing village	• The meaning of international standards.	• As a result of ongoing discussions around this topic, IFC Guidelines were officially adopted as the working framework for the Thilawa SEZ project in the Central Working Body. There is an additional

			discussion of the details in Section 1.3.
8	Save the Children, NGO	• Social impact standard and compensation for the involuntary resettlement according to the international standards.	• As discussed at the meeting, in principle this is an issue for the resettlement study team and not the SEA. However as discussed in the previous item, international standards are adopted as per Section 1.3.

7.3 SEA Stakeholder Meeting (2)

The second official stakeholder meeting for the SEA was held on 26 August 2015. The purpose of the meeting was to present draft SEA and to obtain the people's comments on the SEA. The meeting was held at the temporary office of SEZ Management Committee, Branch Office of Land Use (2), Department of Human Settlement and Housing Development (Thanlyin). The meeting had two sessions: morning session (10am – 12am) and afternoon session (1:30pm – 3pm). In total 303 persons participated, of which 233 in the morning session and 70 in the afternoon session. The participants included government officials, private companies, NGOs and project affected peoples. Presentation materials, notifications and list of attendees are presented in Appendix B.

7.3.1 Announcement

Public announcements were made in two newspapers that are distributed throughout Myanmar. The language of the announcement was Myanmar. For English speaking NGOs, a separate English invitation letter was distributed via email. The two newspapers were Myanmar Alin Daily and The Mirror.

Additionally announcements were made through the local General Administrative Departments (GAD) to concerned villagers, including the Thilawa Social Development Group.

7.3.2 Presentation Reference Materials

Materials, in this case the presentation, were provided upon request to participants.

7.3.3 Transportation

As a rural area, there are no appropriate venues available in the zone. The venue used was the Temporary Office of the SEZ Management Committee, which is roughly 1km to the East-Northeast of the SEZ area on the Thilawa/Dagon road cutting through the middle of the SEZ area from the port and going onto Dagon Bridge. To ease access to this venue, transportation options were provided to stakeholders.

1. From Yangon: A bus and van were provided from Yangon. Roughly 50-60 persons were transported in this manner from Yangon.

2. From Thanlyin and Kyauktan: 6 buses (3 for Thanlyin and 3 for Kyauktan) were provided to ease access for villagers. About 30-40 people per bus.

7.3.4 Record of Discussion

Morning Session

1. Representative of Alwan Sut Village made an inquiry about when the survey would be reported. As he explained, he said he arrived at Alwan Sut Village in 2010. Before the contractor had arrived, he had built his own house and on January 4th, he was still living at Alwan Sut Village. However, he and his family are not in the survey list, so he would like to know when he and his family would be listed. Dr. Than Aung explained that he would have to report to the leader of his mobile worker group or he can report to clerk or manager to check whether or not he is in the list with his leader. If he is still not on the list, it means he is originally not listed in this particular mobile worker group.

2. Representative of Alwan Sut Village suggested that it would be better to announce the meeting one week earlier. He also asked whether or not local people would be included in the five developments mentioned by TSEZMC. TSEZMC replied that when there

were developments within the local area, it would be the same as developing the country. Therefore, when the country becomes develop, individual household in local area becomes developed.

3. Representative of Alwan Sut Village argued that because of the 400 hectares development, there were a problem regarding the waste management since the area was too narrow. He pointed out that it would be better in Thilawa industrial development zone. He said that there were housing for people in economic development zone due to high population density, houses were not enough. The road of resettlement area was too narrow. He also enquired that for the religious architectures located near the industrial area, how those architectures would be managed. Dr. Than Aung, answered that shopping mall, restaurant and dormitories would be all included in 28 hectares area and there would be fencing and boundaries along with the entry and exit points at which security gates and guards would be deployed as in other countries. If he was still not satisfied with this answer, it was recommended that he discussed this matter directly with the Japan Organization which was responsible for all these strategic planning.

Afternoon Session

1. Community Relationship Officer, MJTD said that when the factories operate, there would be pros and cons due to the process of mitigation measure for any impacts. However, she would like to know how much the impact could be reduced and how to know the limitation of impact will be allowed. TSEZMC answered that all environmental impact of factories would be different by the type of business. For example, the wastewater from dried noodle production factory and garment factory would be every different and there would be a different way of analyzing environmental impact and monitoring process. Accordance of internal rules and regulation of TSEZ, TSEZMC would check the primary treatment of a factory first and compare with TSEZ standards. If unsatisfactory operating process existed, TSEZMC would penalize and make a factory to satisfy standards. Also, TSEZMC does not accept a printing factory to establish in SEZ area because it would have more impact to environment. The Consultant Team advised that wastewater treatment plant for each factory would have to be built and one central wastewater treatment plant would be required. Even IFC international standard is being used. National Standard will be issued by ECD.

The comments and the response within the SEA are summarized in the table below.

Table 7-4 SEA Stakeholder Meeting (2) Comments and Response

	Commenter	Comment received	Response
1	Representative of Alwan Sut Village	• He should have been on the survey list but was not. Need check.	• This matter will be checked.
2	Representative of Alwan Sut Village	• Suggested it would be better to announce the meeting one week earlier	
3	Representative of Alwan Sut Village	• Concern on the problem of waste management in Zone A, high population in the area and religious buildings	• Shopping mall, restaurant and dormitories were all included in 28 hectares area and there would be fencing and boundaries along with the entry and exit points at which security gates and guards will be deployed

4	Community Relationship Officer, MJTD	• Want to know how much the impact could be reduced and how to know the limitation of impact will be allowed for each factory	• All environmental impact of factories will be different by the type of business. Accordance of internal rules and regulation of TSEZ, TSEZMC will check first the primary treatment of factory measured by TSEZ standards. If there is not satisfied on that in operation process, TSEZMC makes penalty and try to push this factory to meet with standards.

7.4 Other Comments on the SEA

Other comments than those raised in the stakeholder meetings above are listed with the project proponents' response in Appendix C.

8 Environmental Objectives and Management of Environmental Issues

8.1 Identification of Environmental Problems Related to Change in Land Use

Identifying environmental problems is an opportunity to define key issues and improve the SEA objectives. It is essential to identify general impacts caused by the development and its associated land uses. The issues and problems should be useful for the improvement of the project itself or implementation of the project (e.g., by avoiding future conflicts). Environmental issues will be identified as a subset of the environmental objectives. Environmental issues will be based on the actual implementation of the project and will be defined in the scoping matrix accompanying the final EIA.

8.2 Environmental Objectives

The project has set environmental objectives that will serve to reduce environmental impacts to the Thilawa SEZ regional area. Based on stakeholder consultation combined with environmental findings in the studies conducted and respecting the original strategy for the Thilawa area, the following environmental objectives were defined.

Table 8-1 Environmental Objectives

SEZ Strategy	SEZ Strategy Detail	Resulting Environmental Objective
Economically driven	To Increase value added products & bring “Myanmar Brand”, “Production”, “Education” & “Research & Development” will be enhanced	Ensure that the economic benefits of the project reach the people in the area through training and employment opportunities.
Safe and Secure Livelihoods	Built the SEZ not only a space “Where you want to go to work” but also “Where you want to live in the future”	Ensure that infrastructure (transportation, water, electricity, schools, hospitals, etc.) is improved within the SEZ for companies and also for the communities living in the SEZ.
Environmentally Friendly	To realize healthy & comfortable city life to environment as well as to humans, existing roads & rivers will be kept to the extent possible	Employ environmentally friendly engineering in SEZ development and ensure that environmental quality is managed to minimize impacts on those living in and around the SEZ.
Efficient Infrastructure	To meet the demand of the SEZ, develop the infrastructure as an off-site system of high performance & low environmental impact	Make sure that infrastructure uses resources efficiently and does not contribute to the deterioration of environmental quality.
Eco-Smart	Apply Eco-Smart technology that can reduce the load on the environment & households	Use infrastructure that meets international standards to maintain environmental quality.

Source: SEZ Management Committee

8.3 Managing Pollution and Environmental Conservation in the SEZ

Based on the environmental problems identified and the associated environmental objective section, it is important that an environmental management plan (EMP) is established for the SEZ under the EIA in order to coordinate pollution control efforts and limited impacts from the cumulative accretion of low-level pollution (i.e., cumulative impacts). The EMP will

establish rules and regulations that conform to national regulations and regulations similar to the Zone A area. The final EMP should be reviewed and agreed upon by all relevant stakeholders including affected persons and entities around the site as well as governmental stakeholders such as MOECAF.

For pollution control, the EMP will seek to limit impacts to the environment via setting environmental policy and regulations for air quality, water usage, wastewater effluent, soil quality, and groundwater and surface water quality. These regulations will be followed up with a monitoring and reporting regime in coordination with governmental policy on a forward-looking basis. To create an environmentally-friendly SEZ, the SEZ Law requires the adoption of International Standards. Therefore, the SEZ will take direction from the Central Working Body (the entity with the power to determine standards for the SEZ) and adopt minimum standards based on international best practice. Emissions standards to be referenced will be based on the IFC Environmental, Health, and Safety (EHS) Guidelines. When national standards are issued, the SEZ will meet the national standards.

8.4 Institutional Structure of SEZ Environmental Management

It is noted that the SEZ law stipulates the responsibilities of the management committee will be clarified later by the relevant rules/regulations. It is also noted that the SEZ Management Committee is not under the remit of the Myanmar Investment Commission (MIC) and Foreign Investment Law and therefore the relevant EIA procedures normally done by MIC in conjunction with MOECAF may not be applicable in the context of the SEZ. Additionally, Article 35 of the SEZ Law stipulates that investors shall abide by the environmental standards in the Myanmar Environmental Conservation Law, other existing laws and international standards. This is interpreted to mean that the SEZ managing body should conduct some sort of EIA procedures for the tenants, which will be managed through the SEZ Management Committee's One-Stop Service Center, reflecting practices in the Zone A area.

The implementation and ongoing monitoring of this EMP will be implemented under an organizational structure under the managerial body of the SEZ and matching the structure that is adopted in the Zone A.[10]

The current organizational structure for the EMP operation in Zone A is described in the figure below. The said structure for other zones shall be stipulated in EIA of each zone referring to the structure of Zone A.

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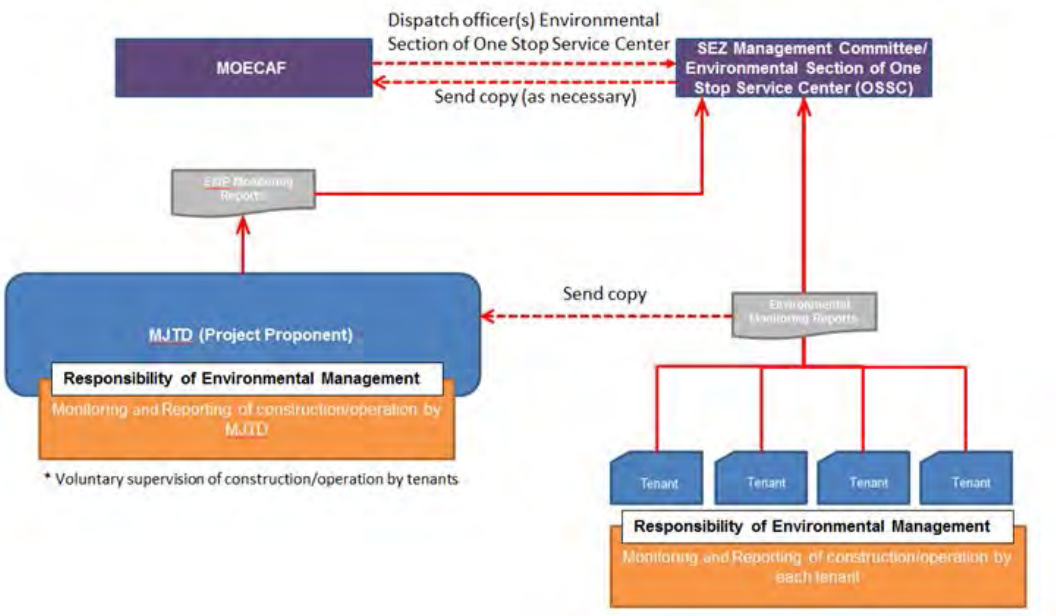
[10] The managerial body for the SEZ may be the SEZ Management Committee and/or the Myanmar-Japan Consortium.



Note: O&M=Operation and Management
Source: SEZ Management Committee

Figure 8-1 Implementation and Monitoring of Environmental Management Plan

8.5 Grievance Mechanism

A grievance mechanism has been established by TSEZMC for Thilawa SEZ Zone. That is, a representative from GAD that has been seconded to the SEZ Management Committee will reside in the project proponent office on site and process grievances when and as they come up. Table below shows the grievance mechanism. TSEZMC expects that complaints should be solved in an amicable way between the parties concerned by taking the following steps.

Table 8-2: Grievance Redress Mechanism

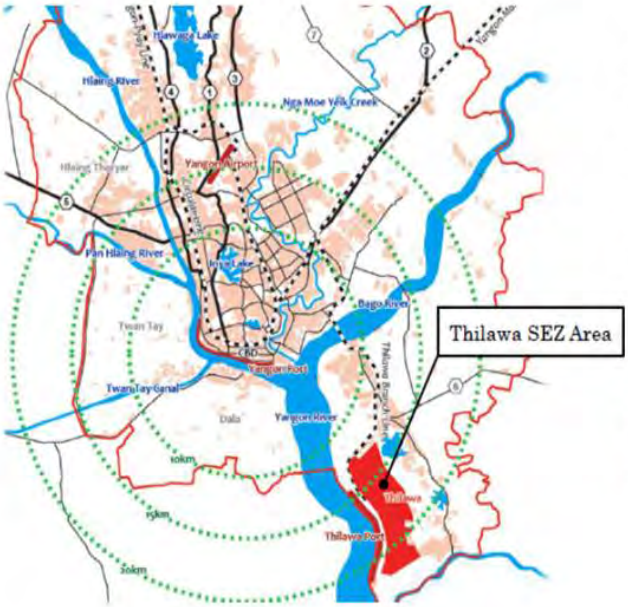
Step	Action
Step 1	TSEZMC assigns one person (Community Engagement Officer, CEO) in charge of Grievance Redress in the SEZ.
Step 2	Project proponents/Investors and GADs shall report all the complaints to CEO.
Step 3	CEO will collect all the complaints and report to TSEZMC and TSEZMC will solve the problems with project proponents/Investors.
Step 4	If not settled, the complaint will be sent to Regional Government (Yangon Region) and Regional Government will solve the problem with related ministries.
Step 5	If not settled, the complaints will be sent to the Central Government and Central Government will solve the problem
Step 6	If not settled, the complaints may be lodged to National Court.

Appendix List

Appendix A: SEA Stakeholder Meeting (1)

1. An English Version of Presentation given at the Stakeholder Meeting

1. Project Description



Project Objectives :
Development of **2,000ha** in Thilawa SEZ, (Except about 400 ha ("Class A zone"))

Project Location :
20km southeast of Yangon in the Townships of Thanlyin and Kyauktan

Project Proponent :
The Thilawa SEZ Management Committee

2. SEA Approach

- Stakeholder Identification
- Baseline Condition (Sensitive Issues)
- Legal Framework
- Development Concept Analysis
- Development/Operation Scenarios
- Possible Constraints
- Possible Mitigation Measures

3. Baseline Condition (Sensitive Issues)

◆ Natural Environment
- Natural Habitat (Mangrove, Stream, Ponds)
- Protected Species.
- Yangon River, Hmawwun River
- Streams, Reservoirs, and Ponds

◆ Social Environment
- Fisheries & Agriculture
- Sensitive Areas, Properties in/around the Project Sites
  - Cultural Assets: Pagodas & Hindu Temples
  - Existing facilities (Universities, Community Facilities) and others
  - Adjacent Village



4. Legal Framework

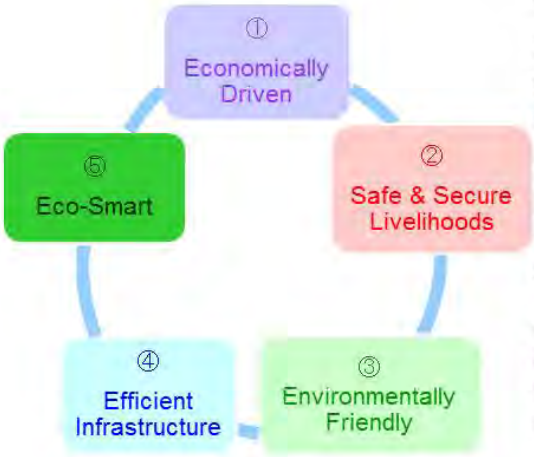
[Laws & Regulations on EIA/SEA]
- Environmental Conservation Law (2012) & Environmental Conservations Rules (2014)
- EIA Procedures (Draft stage)

⇒ NO Specific Environmental Standards/Guidelines/Regulations in Myanmar

[Other Laws & Regulations]
- Myanmar Special Economic Zone Law (2014)

Stipulates that **investors shall abide by the International Standards**
- Effluent Standards by Ministry of Industry


5. Development Concept - METI Study -



① To Increase value added products & bring "Myanmar Brand", "Production", "Education" & "Research & Development" will be enhanced

② Build the SEZ not only a space "where you want to go to work" but also "where you want to live in the future"

③ To realize healthy & comfortable city life to environment as well as to humans, existing roads & rivers will be kept to the extent possible

④ To meet the demand of the SEZ, develop the infrastructure as an off-site system of high performance & low environmental impact

⑤ Apply Eco-Smart technology that can reduce the load on the environment & households.

6. Conflictions of Development Concept

	Economically Driven	Safe & Secure Livelihood	Environmentally Friendly	Efficient Infra-structure	Eco-Smart
Economically Driven "Myanmar Brand Products" →enhance "Production", "Education" & "Research & Development"		×	×	●	▲
Safe & Secure Livelihood Develop the SEZ as "Where you want to live in the future"			◎	◎	●
Environmentally Friendly Existing roads & rivers will be kept to the extent possible				●	◎
Efficient Infrastructure Develop the infrastructure as an off-site system of high performance & low environmental impact					●
Eco-Smart Apply Eco-Smart technology that can reduce the load on the environment & households					

◎: Good match ● : Match ▲: Not Match × : Conflict

What environment should be retained/created?

Identified Major Conflicts

Environmentally Friendly
Existing roads & rivers will be kept to the extent possible

×

Economically Driven
Making more space for sellable area.

Safe & Secure Livelihood
Develop the SEZ as "Where you want to live in the future", not only for work.

×

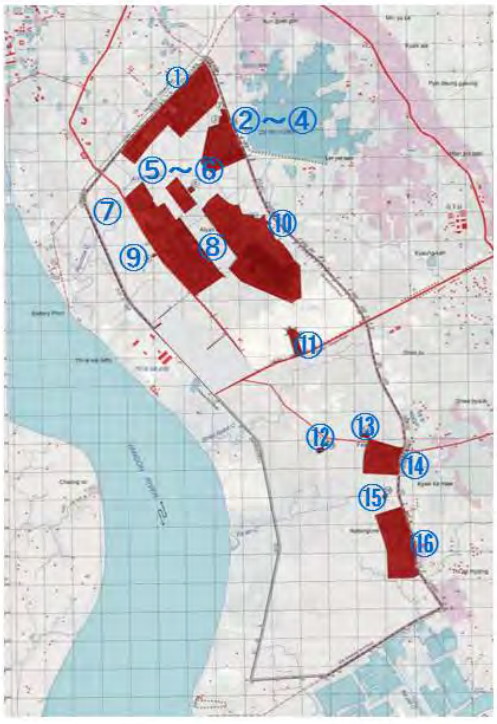
Economically Driven
Making more space for sellable area.

Considering the development in the region and Natural Environment, Cultural and Historical Background:

What environment should be created and/or retained for the future?

8

7. Development Scenario - Key Point 1: Excluded Area



①	Myanmar Economic Cooperation Grass Factory & Ministry of Industry (MoI) Flask Factory
②	Hostel of Maritime University
③	Phanchat Monastery
④	Maritime University
⑤	MoI Power Distribution Plant
⑥	Area for the Factory construction by MoI
⑦	Myanmar Economic Cooperation's Galvanized Iron Sheet Factory & Shoe Factory
⑧	MoI Packaging Factory & Garment Factories
⑨	Church
⑩	Thilawa Dam
⑪	Thilawa Konetan Monastery
⑫	Phalankanoo Monastery
⑬	Phalanywaroo Pahayalay Monastery
⑭	Ayemyathida Ward
⑮	Hindu Temple
⑯	Shwepyitharyar Ward

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7. Development Scenario - Key Point 2: Creek -

Environmentally Friendly
Existing roads & rivers will be kept to the extent possible

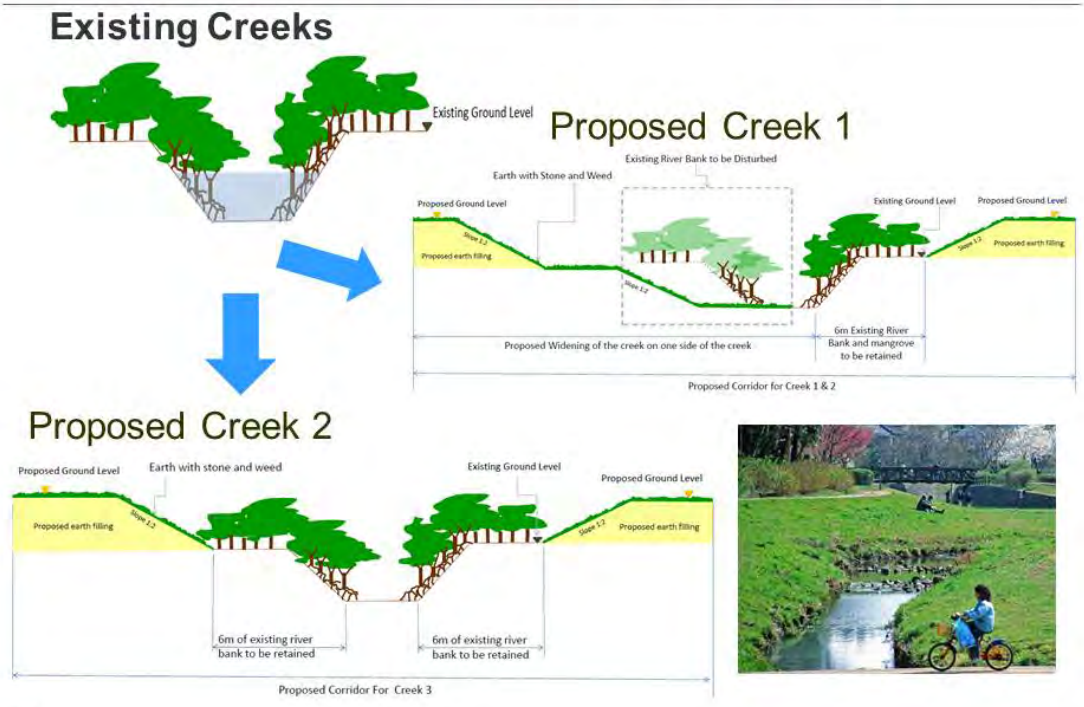
×

Economically Driven
Making more space for sellable area.

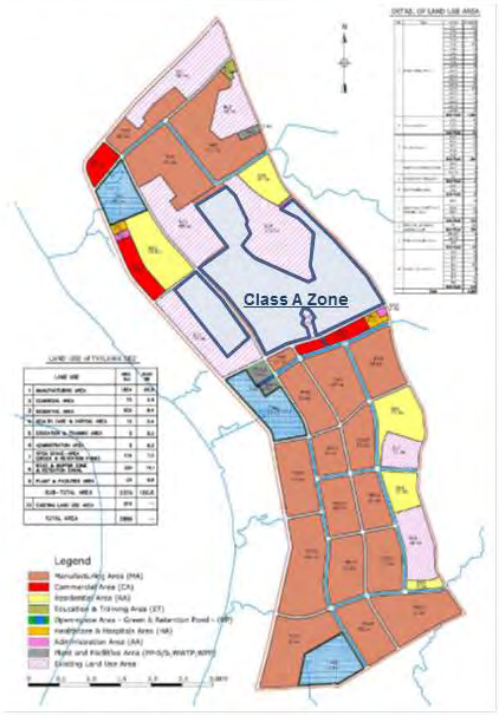
Natural Bank Protection

Bank Protection with Concrete Wall

7. Development Scenario - Key Point 2: Creek -



7. Development Scenario - Original Plan -



7. Development Scenario - Alternative Plan -

Major Items	Alternative 1 (Original Plan)	Alternative 2 (Upgraded Plan)
Land Use Plan	Total Area: 1,980a Industrial Area: 1158ha Residential Area: 200ha Commercial Area: 70ha Common Area: 552ha	Total Area: 1,819ha Industrial Area: 986ha Residential Area: 131ha Commercial Area: 15ha Common Area: 687ha
Natural Environment		
Ecosystem	Mangrove habitat (Water streams) will be lost.	Mangrove habitats (Water streams) will remain. One pond located next to the monastery in the center of the project site will remain.
Hydrology (Flood Control)	Three Retention ponds are to be constructed. Main streams will be altered to concrete water channel.	Three Retention ponds are to be constructed. Main streams will be expanded to allow more flow rate, keeping the current routes and ecology
Social Environment		
Resettlement	There are settlers who live in the project site and need relocation.	
Cultural Heritage	The conservation of cultural assets is not considered well.	Cultural Assets are avoided and kept as it is based on the relevant laws and regulations.

8. Possible Constraints in Development Phase

1) What impacts are anticipated by the development?

2) How to protect the natural environment?

- Loss of mangrove
- Loss of natural habitat for fish and birds
- Possibility of floods

3) How to reduce impacts on local people?

- Impacts on Livelihood of Farmers and Fishermen
- Impacts on Cultural Assets/ Adjacent Villages/ Universities, Community Facilities in Excluded Areas and surrounding areas, etc.
- Impacts related to HIV/AIDs and communicable disease

9. Operational Scenario

Potential Industrial Sectors
[Significant Current Demand]

Food and Beverage, Textiles, Chemicals, and Construction Material

[Emerging Industries]

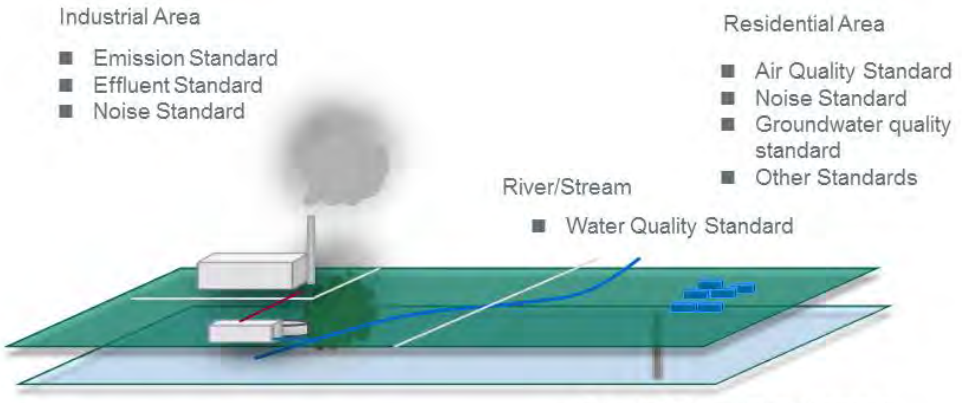
Wood and Related Products, Machinery and Equipment, Electrical and Electronics, and Automotive Manufacturing

10. Possible Constraints in Operation Phase

How to Control Impacts/Pollutants?

- Impact on water resources (streams/rivers)
- Impact on ambient Air, noise & vibration
- Generation of waste
- Impacts related to Land Subsidence due to the use of underground water
- Impacts on fauna & flora (pollution in soil and water environment)
- Social Impacts such including safety, landscape, community and so on
- Cumulative Impacts by accumulation of factories
- Complaints from the surrounding communities and others
- Response to the local authorities, change in environmental and social laws and regulations

11. Key Point Environmental Standards



12. Key Point - Environmental Management -

Environmental Impacts as a result of Daily Industrial Activities in SEZ

- Industries in SEZ are related to air pollution, water pollution, noise and vibration, odor and waste. As the number of factories increase, *cumulative impacts* will occur.

Possible Measures: EMP

- Comprehensive Management System for Thilawa SEZ
- Individual Management System by each Tenant
- WWTP

[Key Issue]

- Environmental Permit and Monitoring Mechanism with Responsible Partiers

18

What is an Environmental Management Plan (EMP)?

An instrument that details (a) the measures to be taken during the implementation and operation of a project to eliminate or offset adverse environmental impacts, or to reduce them to acceptable levels; and (b) the actions needed to implement these measures.

EMP is an on-going document prepared as a part of EIA and used throughout the project cycle.

Contents of EMP

- Summarize environmental impacts identified in the EA report
- Identify impacts that must be mitigated
- Describe mitigation measures
- Describe monitoring and reporting arrangements including Grievance Redress
- Describe assignment of responsibilities and schedules
- Provide costs estimates for mitigation and monitoring measures

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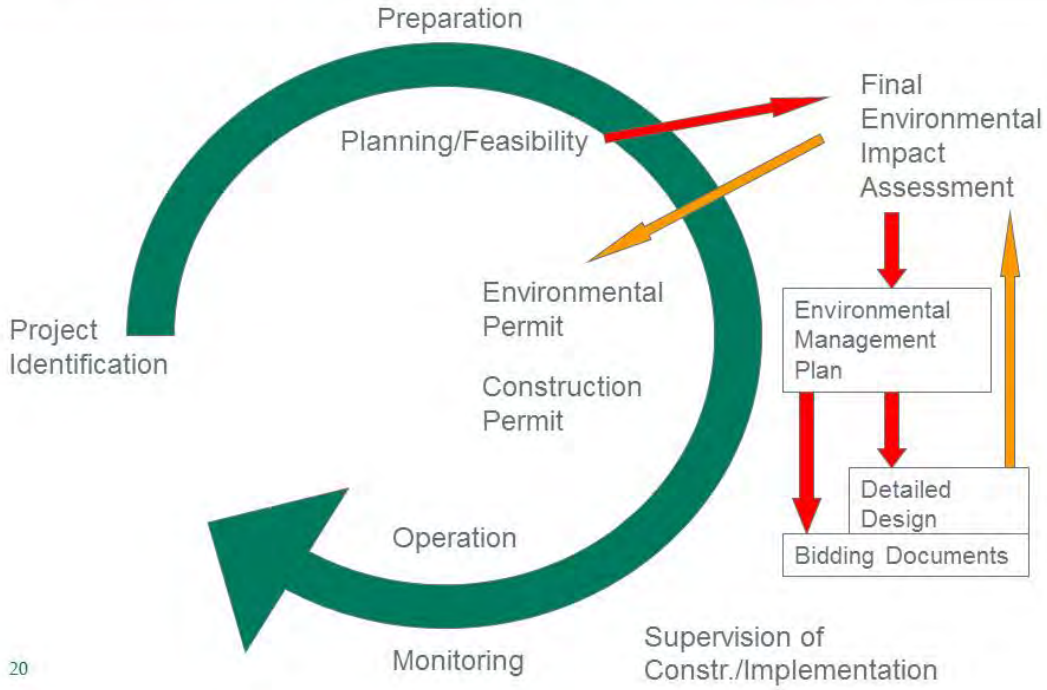
Integration of EMP into Standard ECA Practice



Thank you!

General stakeholder comments can be directed to:
Thilawaygn@gmail.com (SEZ Management Committee)

2. Attendance List

Government and Private Business Stakeholders

No.	Name	Position	Department
1	U Soe Than	ACE	YCDC
2	Daw Khaing Cho Win	Staff Officer(DICA)	TSEZ
3	Daw Mya Myat Chal	SAE	Public Work /TSEZ
4	U Zaw Win Myint	Assistant Driector	Immigration & National Registration Dept.
5	U Win Swe	Assistant Driector	Custom
6	U Thein Zaw	Staff Officer	Internal Revenue
7	U Soe Thein	Dupty Chief Engineer (Civil)	Myanmar Port Authority
8	Daw Thandar Oo	Surveyor	MKI
9	U Min Zaw	Village GAD	Nyoung Wine Village
10	U Thein Han	Member	Landuse Committee
11	U Thein Win	GM	Top-Food (HlaingTharYar)
12	Daw Thida Sein		
13	U Min Tala Nyan	Country Manager	Ball Asia Pacific Limited
14	U Myo Naing	Staff Officer	Dept. of Labour
15	U Thein Zaw	Staff Officer	Internal Revenue
16	U Tin Oo	Professor	Co-operative University (Thanlyin)
17	Daw Hnin Wutt Yee	Manager	Myanmar Center for Responsible Business,MCRB
18	U Win Ko	Staff Officer	Ministry of Commerce
19	Dr.Sapal Phyu Lwin	Assistant Driector	Ministry of Construction
20	U Aye Lwin	GAD	Shwe Phi Thar Quatar
21	U Zaw Myo Naing	Member of GAD	Shwe Phi Thar Quatar
22	U Tin Latt Yee	Village GAD	Shwe Pyouk Village
23	U Kyaw Myin	Member of GAD	Shwe Pyouk Village
24	U Linn Aung Htike	Member of GAD	Shwe Pyouk Village
25	U Ko Ko Naing	Staff Officer	Immigration & National Registration Dept.(Kyouk Tann)
26	U Htain Linn	GAD	A Lwam Sweet Village
27	U Win Naing	Police Officer	Police Station (Thilawa)
28	Daw Sandar Min	Head of Corp.	Yoma Bank
29	U Htun Htun	Driector	Yoma Bank
30	U Sa Myint Swe	ATEO	ThanLyin
31	U San Hla Zaw	AMA	Yangon
32	U Thet Zaw Oo	AMA	Yangon

33	Dr.Thida Htwe	Staff Officer	
34	Daw Ei Ei Khaing	Staff Officer	GAD (South)
35	U Soe Ko Ko	GM	P.P.Committee
36	U Myint Thu	GAD	AyeMyaThidar
37	U Sun Tint	GAD	AyeMyaThidar
38	U Tin Ohn	GAD	AyeMyaThidar
39	U Than Lwim	GAD	AyeMyaThidar
40	U Hla Thann	GAD	AyeMyaThidar
41	U Ohn Myint	GAD	AyeMyaThidar
42	U Kan Thar	GAD	AyeMyaThidar
43	U Sein Htay	GAD	AyeMyaThidar
44	U Htay Aung	Staff Officer	Dept. of Agriculture (Kyouk Tann)
45	Daw Aye Aye Than	Staff Officer	Dept. of Planning
46	U Aye Cho	Development GAD	Kyoung Kone Gyi Village
47	U Myint Lwim	Quatar GAD	Thida Mying Quatar
48	U Soe Win	Member of Quatar GAD	Thida Mying Quatar
49	U Mya Aye	Member of Quatar GAD	Thida Mying Quatar
50	U Hla Myint	PR Officer	Development Fondation
51	U Win Myint	Staff Officer	SLRD
52	U Zaw Zaw	Manager	Dagon International
53	Daw Khin Htwe Phyu	Staff Officer	Dept. of Agriculture
54	Daw Nyo Nyo Than	Assistant Driector	Dept. of Archaeology, National Museum & Library
55	U Khaing Lay	Regional Staff Officer	Directorate of Industrial Supervision and Inspection
56	Daw Hnin Hnin Yee		Directorate of Industrial Supervision and Inspection
57	Daw Cho Cho Win	Assistant Driector	Directorate of Industrial Supervision and Inspection
58	U Myint Hlaing	Village GAD	Kyoung Kone Gyi Village
59	U Myint Naing	Member of Village GAD	Kyoung Kone Gyi Village
60	U Win Htay	Village GAD	Phayar Gone Village
61	U Soe Win	Member of village GAD	Phayar Gone Village
62	U Myo Tint	Menber of village GAD	Phayar Gone Village
63	Daw Ohmar Aung	Dupty Driector	Dept. of Archaeology, National Museum & Library
64	U Myint Aung	EC	FREDA
65	U Aye Htun	Farmers' Representative	Thilawa
66	U Kyaw Zaw	Officer	MTSH

67	Dr. Toe Toe	Staff Officer	Thanlyin Hospital
68	U Zaw Khaing	Ranger	Forest Dept.,Kyouk Tann
70	U Kyaw Swar Min	Staff Officer	SLRD
71	U Aye Min Naing	Staff-4	SLRD
72	U Htun Hla Shwe	Regional Representative	
73	U Myo Myint	Regional Representative	
74	U Aung Nyein	KTW Developmet Chairman	
75	U Tin Soe	Chairman(DC)	DC Committee (Kyouk Tann)
76	U Thoung Win	Development City Committee	Kyouk Tann
77	U Thein Zaw Lay	Chairman(DC)	DC Committee (Thanlyin)
78	U Myint Thein	Member of DC	Thanlyin
79	U Tin Win	Member of DC	Thanlyin
80	U Aung Aung Toe	Member of DC	Thanlyin
81	Gen: Aung Nyint	Member of DC	Thanlyin
82	Capt: Chit Nyint	Member of DC	Thanlyin
84	U Kyaw Linn Than	Staff Officer	Thanlyin
85	U Ko Ko Naing		Bogyoke Village
86	U Swe Lwin Htun	Township Lawyer	Dept. of Law (Thanlyin)
87	U Soe Tint	Distinct Staff Officer	Ministry of Industry (Thanlyin)
88	U Aung Phae Kyin	Assistant Professor	Dagon University
89	U Aye Kyuu	Village GAD	Latt Yate San Village
90	U Myint	Member of Village GAD	Latt Yate San Village
91	U Myint Oo	Member of Village GAD	Latt Yate San Village
92	Daw Khin Ma Ma	Planning Officer	Thanlyin
93	Dr.Thein Thein Oo	Staff Officer	Livestock Breeding & Veterinary Dept. (Thanlyin)
94	Dr.Myat Lwin	Rector	Myanmar Marine Time University
95	U Myo Lwin	Staff Officer	Dept. of Human Settlement & Housing Development

Local Stakeholders including Project Affected Persons (PAPs)

No.	Name	Address	Occupation
1	U Soe Thein	Thilawa	Farmer
2	U Kyaw Kyaw	Kayat Thidar Myaing	Farmer
3	Daw Sandar Myint	Alwinsweet	Dependence
4	U Maung Ko	Alwinsweet	Farmer
5	Daw Than Than Nu	Thilawa	Farmer
6	Daw Hla Oo	Alwinsweet	

7	Daw Maw	Alwinsweet	Dependence
8	U San Lwin	Alwinsweet	Carpenter
9	U Htun Wai	Alwinsweet	Fire Fighter
10	Daw Mya Sein	Alwinsweet	Casual
11	Daw Myo Myo	Alwinsweet	Dependence
12	Daw Myint Myint Htay	Alwinsweet	Seller
13	Daw Khin That Maw	Alwinsweet	Casual
14	Daw Khiw Htwe	Alwinsweet	Seller
15	Daw San Yu	Alwinsweet	Dependence
16	Daw Kyin O	Alwinsweet	Dependence
17	Daw Lat Lat War	Alwinsweet	Casual
18	U Ye Lwin Oo	Alwinsweet	Casual
19	U Kyaw Linn Naing	Alwinsweet	Casual
20	U Ko Aung	Alwinsweet	Casual
21	U Thein Zaw	Alwinsweet	Casual
22	U Kyaw Thin	Alwinsweet	Carpenter
23	Daw Myint Myint San	Alwinsweet	Seller
24	Daw San Tint	Alwinsweet	
25	Daw Pa Pa Htwe	Alwinsweet	Dependence
26	Daw Aye Nyein		Seller
27	Daw Than Sint	Alwinsweet	Seller
28	Daw Ohn Myint	Alwinsweet	
29	Daw Hla Myint	Alwinsweet	Seller
30	Daw San Lwin	Alwinsweet	Seller
31	Daw Moe Swe	Alwinsweet	Dependence
32	Daw Than Aye	Alwinsweet	Seller
33	Daw Thin Thin Mar	Alwinsweet	Mason worker
34	Daw Cho Mar Linn	Alwinsweet	Tailor
35	Daw Thin Kyi	Alwinsweet	
36	U Tun Yee	Nyaung Wine Group	Carpenter
37	Daw Than Than Soe	Ahtut Taw	Casual
38	Daw Maw	Alwinsweet	Mason worker
39	Daw Yin Shwe	Alwinsweet	Dependence
40	U Maung San Maw	Alwinsweet	Farmer
41	Daw Soe	Alwinsweet	Seller
42	U Maung Zaw	Alwinsweet	Mason worker
43	U Maung Myint	Alwinsweet	Seller
44	U Soe Min Htet	Alwinsweet	Mason worker

45	Daw Khaing	Alwinsweet	Farmer
46	U Nyain Pyae Sone	Alwinsweet	Mason worker
47	Daw Kyi Kyi Aye	Alwinsweet	Mason worker
48	Daw Kyi Kyi	Alwinsweet	Retired
49	U Kalar	Alwinsweet	Water Seller
50	Daw Zin Thein	Thilawa,Shwepyithawar3	Farmer
51	U Aye Hlaing	Thilawa,Shwepyithawar3	Farmer
52	U Win Thant	Thilawa,Shwepyithawar3	Farmer
53	U Win Khaing	Alwinsweet	Casual
54	U Thein Htun	Alwinsweet	Casual
55	Daw Khin Soe Mar	Aye Mya Thidar	Farmer
56	U Kyin O		Farmer
57	U Zaw Win Oo		IT
58	Daw Su	Alwinsweet	Casual
59	Daw San New	Alwinsweet	Casual
60	Daw Yee Yee Mya	Alwinsweet	Dependence
61	Daw Khin Aye Kyu	Alwinsweet	Mason worker
62	Daw Khin Win Kyi	Alwinsweet	Dependence
63	Daw Lone Chit	Alwinsweet	Dependence
64	Daw San San Aye	Alwinsweet	Dependence
65	Daw Thin Thin Aye	Alwinsweet	Dependence
66	Daw Ohn	Alwinsweet	
67	U Zaw Myo Thein	Alwinsweet	Seller
68	Daw Hla Yee	Alwinsweet	
69	Daw Khin	Alwinsweet	
70	U Thein Aung	Alwinsweet	Construction
71	U Than Htate	Alwinsweet	Casual
72	Daw Than Than Htwe	Thilawa Monastery	Dependence
73	Daw Htae	Thilawa	Dependence
74	Daw Tin Ohn	Alwinsweet	Dependence
75	Daw Win Marlar	Alwinsweet	Dependence
76	Daw Aye Htae	Alwinsweet	Dependence
77	Daw Aye Cho	Alwinsweet	Dependence
78	Daw Thay Thay	Alwinsweet	Seller
79	U Ko Naing	Alwinsweet	Mason worker
80	Daw Aye Su Latt	Moekyoswam Monastery	Mason worker
81	Daw Khin Htwe Yee	Thilawa	Casual
82	U Htay Oo	Thilawa	Casual

83	U Khin Oo	Thilawa	Mason worker
84	Daw Khin San Myint	Thilawa	Casual
85	U Khin Zaw	Thilawa	Farmer
86	Daw Theingy Wai	Thilawa	Casual
87	Daw Thi Thi Swe	Alwinsweet	Dependence
88	U Zon Win Mg	Alwinsweet	
89	U Htay Lwin	Thilawa	Farmer
90	Daw Thin Thin Maw	Alwinsweet	Casual
91	U Kyaw Htwae	Thilawa	Casual
92	Daw Win Win Cho	Alwinsweet	Dependence
93	Daw San	Alwinsweet	Farmer
94	U Aung Htun	Thilawa Kone Lam	Farmer
95	U Htay Aung	Tarmwe	Trader
96	Daw Nan Ngwe Kyi	Tarmwe	Dependence
97	Daw San Win	Alwinsweet	Dependence
98	Daw San		Farmer
99	U San Win	Thida Myit	Farmer
100	Daw Kyamar	Alwinsweet	Seller
101	Daw Myint Shwe	Alwinsweet	Carpenter
102	Daw Nan Ei Mon	Alwinsweet	Mason worker
103	Daw Nyein Nyo San	Alwinsweet	
104	U Chin Nartipi	Pilasat Village	Farmer
105	Daw Nwae Yee		Casual
106	U San Win	Middle Village,Thilawa	Seller
107	U Kanar Sar	Shwe Pyithar Village	Farmer
108	Daw Narari	Shwe Pyithar Village	Farmer
109	U Zaw Lwin	Kontan	Farmer
110	U Kyi Khaing	Alwinsweet	Casual
111	Daw Than Aye	Alwinsweet	Agriculture
112	U Than Zaw Oo	Shwe Pyauk	Agriculture
113	U Myint Aung	Shwe Pyauk	Agriculture
114	U Tint Lwin	Shwe Pyauk	Seller
115	U Thein Lwin	Alwinsweet	Taungyar
116	Daw Thuzar Min	Shwe Pyauk	Taungyar
117	U Aye Lwin	Alwinsweet	Carpenter
118	U An Kyaw Myint	Shwe Pyithar Village	Casual
119	U Kantayar	Tharyar Kone	Farmer
120	U Kyaw Kyaw	Alwinsweet	Farmer

121	U Putar Kyar	Tharyar Kone	Farmer
122	U Tin Myint	Shwe Pyitharyar	Farmer
123	U Win Naing	Shwe Pyithar Village	Farmer
124	U Sarmi	Shwe Pyitharyar	Farmer
125	U Myint Shwe	Alwinsweet	Farmer
126	U Gaw Bar Lu	Shwe Pyitharyar	Farmer
127	U Mg Myint	Shwe Pyitharyar	Farmer
128	U Kanasar	Shwe Pyitharyar	Farmer
129	U Buki	Shwe Pyitharyar	Farmer
130	U Than Soe	Shwe Pyitharyar	Casual
131	U San Tin	Alwinsweet	Casual
132	U Tin Naing Htun	Alwinsweet	Driver
133	U Myo Min Htun	Thilawa	Casual
134	U Moe Zaw Htwe	Thilawa	Casual
135	U Kyaw Kyaw	Thilawa	Casual
136	U Zaw Htun Naing	Alwinsweet	Casual
137	U Nyin Myint	Thilawa	Casual
138	U Mya Soe	Alwinsweet	
139	Daw Khin Cho Win	Alwinsweet	General
140	Daw San Win	Moekyoswam	Seller
141	Myint Ko	Moekyoswam	Seller
142	Wai Zin Oo	Moekyoswam	Seller
143	Daw Aye Myint	Moekyoswam	Dependence
144	Ma Wai	Alwinsweet	
145	Ma New	Alwinsweet	
146	U Han Sein	Alwinsweet	
147	Daw Khin Mar Kyi	Alwinsweet	
148	That Lwin Oo	Alwinsweet	
149	U Kyaw Hlaing	Alwinsweet	
150	Ma Kyaut Ei Ei Lin		
151	Daw Malar		Dependence
152	Daw Thaw Larsi		
153	Hnin New	Alwinsweet	
154	Aung Kyi Lwin	Alwinsweet	
155	U Karlipar		
156	U Kanaysar		
157	Daw Oo Oo		
158	U Nay Myo Aung	Moekyoswam	Seller

159	U Mya Than	Alwinsweet	
160	U Myint Naing	Alwinsweet	Mason worker
161	Daw San	Alwinsweet	Seller
162	Daw May That Khaing	Alwinsweet	Construction
163	Daw Than Htay	Alwinsweet	Construction
164	Daw Nan Theingy Htwe	Alwinsweet	Casual
165	U Phat Ti	Shwe Pyitharyar	Farmer
166	U Kyaw Swar	Shwe Pyitharyar	Farmer
167	U Myint Soe	Alwinsweet	Construction
168	U Yanshin	Alwinsweet	Construction
169	U Khin Mg Aye		
170	U Darmu	Shwe Pyitharyar	
171	U Mg Zaw	Shwe Pyitharyar	
172	U Than Soe	Thilawa Kontane	
173	UTin Hlaing	Thilawa	
174	Daw Nwae Nwae Yee	Thilawa	
175	U Win	Thilawa	
176	U Moe Kyaw	Thilawa	
177	U Kyaw Win	Thilawa	
178	U Aung Aung	Thilawa	
179	Daw Cho	Thilawa	
180	Daw Khin Hla	Thilawa	
181	Daw Aye Gyi	Thilawa	
182	U Dar Gyar	Thilawa	
183	U Chit Ko	Alwinsweet	
184	U Hla Kyaing	Thilawa	Farmer
185	Daw Saturi	Thilawa	General
186	Daw Aye Mar	Alwinsweet	
187	Daw Than Tint	Alwinsweet	General
188	Daw Htay Myint	Alwinsweet	Dependence
189	Daw Muhtuma	Thilawa Konetam	Dependence
190	Daw Yeshwe	Alwinsweet	Dependence
191	Daw Zar Zar Thein	Thilawa	Dependence
192	Daw San Wai Oo	Thilawa	Dependence
193	Daw Bomi	Thilawa	Dependence
194	Daw Sanda Myo	Alwinsweet	Dependence
195	Daw Khin Aye	Alwinsweet	Dependence
196	U Ko Ko Min	Alwinsweet	Dependence

197	Daw Par Par Thi	Phalan Village	Dependence
198	U Bo Tun	Alwinsweet	Construction
199	Daw San Ngwe	Alwinsweet	Mason worker
200	Daw Than Htae	Thilawa	Casual
201	Daw Tin Tin Nyo	Alwinsweet	Mason worker
202	Daw Mya Thandar Win	Alwinsweet	Mason worker
203	Daw Yee Myint	Alwinsweet	Mason worker
204	Daw Moe Thu	Alwinsweet	Mason worker
205	Daw Khaing	Alwinsweet	Mason worker
206	U Zaw Oo	Alwinsweet Konetane	Carrier
207	U Zaw Win Htate	Alwinsweet	
208	U Zaw Myo Oo	Alwinsweet	
209	U Tin Mg Tun	Alwinsweet	
210	U Saing Aung Aung	Alwinsweet	
211	U Aung Tin Win	Alwinsweet	Casual
212	U Khin Marlar	Alwinsweet	Casual
213	U Tin Myint	Alwinsweet	Casual
214	Daw Cho	Alwinsweet	Machine Assist
215	U Win Thaw	Alwinsweet	Mason worker
216	Daw Myint Khaing	Thilawa	Casual
217	Daw Htay Win	Moekyoswam	Seller
218	U Chit Moe	Moekyoswam	Casual
219	U Min Naung	Moekyoswam	Mason worker
220	Daw Khin Khin Thein	Moekyoswam	Seller
221	Daw San Kyi	Moekyoswam	Seller
222	Daw Nwae Yee Win	Moekyoswam	Seller
223	Daw Yin Nu	Moekyoswam	Seller
224	U Wai Linn	Moekyoswam	Casual
225	Daw Zarni Hlaing	Moekyoswam	Seller
226	U Myint Hlaing	Moekyoswam	Seller
227	U Zaw Myo Thant	Moekyoswam	Seller
228	U Win Khaing	Moekyoswam	Casual(MRT)
229	U Myo Min Htun	Moekyoswam	Casual

Media and NGOs

No	Name	Position	Media
1	U Nyein Zin Soe	Reporter	MRTV-4
2	U Saw Hti	Cameraman	MRTV-4

3	U Myat Thiha Tun	Cameraman	MRTV-4
4	U Tun Myint	Reoorter	RFA
5	Daw Khin Yadanar Tun	Reporter	The New Light of Myanmar
6	U Tin	Myitsone Agriculture	Myitsone Agriculture
7	Daw Shwe Lay	Reporter	Modern Journal
8	U Phoe Pyone	Cameraman	MRTV
9	Hong Sar	Cameraman	MIZZIMA
10	U Aung Kyan	Retire	
11	Daw Ohmar Han	Cameraman-level 1	MRTV News
12	Daw Mya Thin Khing	Cameraman-level 1	MRTV News
13	U Sithu Aung	Reporter	MIZZIMA-TV
14	U Aung Thura	Senior Reporter	MIZZIMA-Business
15	U Sithu Zayar	B.J	DVB
16	U Soe Win	Reporter	The Mirror News
17	U Htin Linn Aung	Senior Reporter	MIZZIMA
18	U Aung Myo Kyaw	Reporter	MWD NEWS Daily
19	U Aung Myint Htay	Reporter	City News
20	U Kaung Sat Naing	Reporter	The Voice
21	U Ko Ko Gyi	Reporter	MIZZIMA Bussiness Weekly Magazine
22	U Zaw Htike	Senior Reporter	Myanmar Times
23	Dr Thein Aung	Vice Chairman	Myanmar Bird and Nature Association
24	Ma Lai Lawn Sanga	Manager	Alpha & Omega
25	U Thein Htike Oo	PO	Vermont Law School
26	Daw May Thazin Aung	Project Specilist	VLS
27	Yen Snaing	Reporter	Irrewaddy
28	U Ye Nandar Lin Myint	Reporter	City FM
29	U Pyae Song Aung	Reporter	Eleven
30	Daw May Oo Kyin Nar Naing	Reporter	Modern / Dana Journal

3. Public Announcement

The Mirror (27 June 2014)

ဖိတ်ကြားခြင်း

သီလဝါအထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီအနေဖြင့် သီလဝါ အထူးစီးပွားရေးဇုန် စီမံကိန်းဧရိယာအတွင်း ဧရိယာဟက်တာ (၂၀၀၀) အကောင်အထည်ဖော်ရန် အတွက် မဟာဗျူဟာမြောက် ပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း (Strategic Environmental Assessment - SEA) နှင့် ပတ်သက်၍သက်ဆိုင်သူများနှင့်တွေ့ဆုံပွဲ (Stakeholder Meeting) ကို ၂၀၁၄ ခုနှစ်၊ ဇွန်လ(၃၀) ရက်နေ့ (တနင်္လာနေ့) နံနက် (၁၀:၀၀နာရီမှ ၁၁:၀၀ နာရီအထိ) မြို့ပြနှင့်အိုးအိမ်ဖွံ့ဖြိုးရေးဦးစီးဌာန၊ မြေယာရုံးခွဲ (၂)၊ သန်လျင်မြို့နယ် (သီလဝါအထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှု ကော်မတီ ယာယီရုံး) ၌ကျင်းပသွားမည် ဖြစ်ပါသဖြင့် စိတ်ပါဝင်စားသူများ တက်ရောက် နိုင်ပါရန် လေးစားစွာဖြင့် ဖိတ်ကြားအပ်ပါသည်။ တက်ရောက် လိုသူ များသည် Email: thilawaygn@gmail.com သို့ (၂၈-၆-၂၀၁၄) ရက်နေ့ နောက်ဆုံးထား၍ ပေးပို့ ဆက်သွယ်ပေးနိုင်ပါရန် အကြောင်းကြားအပ် ပါသည်။

သီလဝါ အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီ

[illegible]

Myanma Alinn Daily (27 June 2014)


GSM/WCDMA

International Outbound Roaming Service

(Strategic Environmental Assessment SEA)

(Stakeholder Meeting)

Email: thilawaygn@gmail.com

4. English invitation letter – distributed throughout the week of 23 June 2014

Recipients:

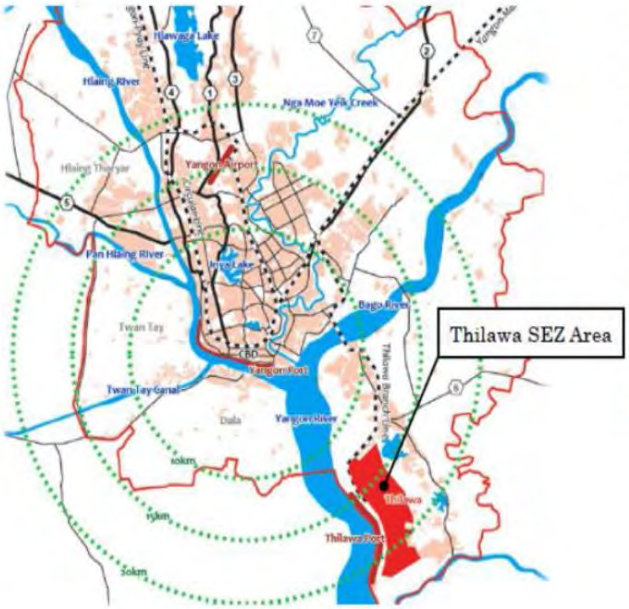
- Myanmar Bird and Nature Society

- International HIV/AIDS Alliance in Myanmar
- Swanyee Development Institute
- Myanmar Centre for Responsible Business
- International Commission of Jurists
- Vermont Law School Myanmar Program
- EcoDev
- Spectrum Consulting
- Freda Myanmar
- Friends of Wildlife

Appendix B: SEA Stakeholder Meeting (2)

1. Presentation given at the Stakeholder Meeting

1. Project Description



Project Objectives :
Development of Thilawa SEZ

Project Location :
20km southeast of Yangon in the Townships of Thanlyin and Kyauktan

Project Proponent :
The Thilawa SEZ Management Committee

2. SEA Approach

- Stakeholder Identification
- Baseline Condition (Sensitive Issues)
- Legal Framework
- Development Concept Analysis
- Development/Operation Scenarios
- Possible Constraints
- Possible Mitigation Measures
- EIA

3. Baseline Condition (Sensitive Issues)

◆ Natural Environment
- Natural Habitat (Mangrove, Stream, Ponds)
- Protected Species.
- Yangon River, Hmawwun River
- Streams, Reservoirs, and Ponds

◆ Social Environment
- Fisheries & Agriculture
- Sensitive Areas, Properties in/around the Project Sites
  - Cultural Assets: Pagodas & Hindu Temples
  - Existing facilities (Universities, Community Facilities) and others
  - Adjacent Village



4. Legal Framework

[Laws & Regulations on EIA/SEA]
- Environmental Conservation Law (2012) & Environmental Conservations Rules (2014)
- EIA Procedures (Draft stage)

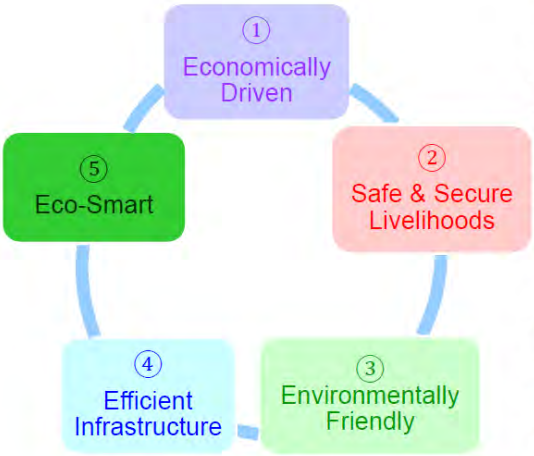
⇒ **NO Specific Environmental Standards/Guidelines/Regulations in Myanmar**

⇒ **National Environmental Standards under development.**

[Other Laws & Regulations]
- Myanmar Special Economic Zone Law (2014)

Stipulates that investors shall abide by the International Standards
- Interim environmental standards (based on IFC EHS Guidelines)


5. Development Concept - METI Study -



① To Increase value added products & bring “Myanmar Brand”, “Production”, “Education” & “Research & Development” will be enhanced

② Build the SEZ not only a space “where you want to go to work” but also “where you want to live in the future”

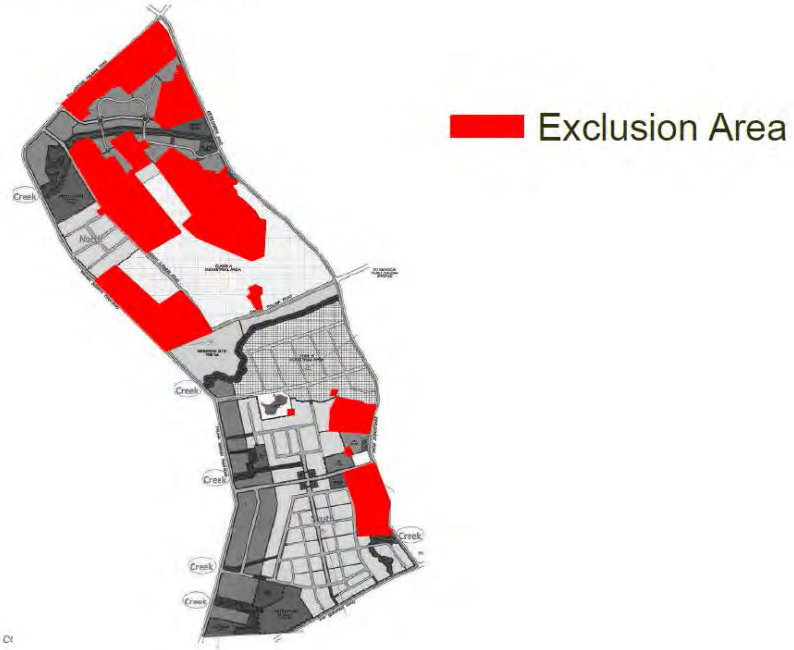
③ To realize healthy & comfortable city life to environment as well as to humans, existing roads & rivers will be kept to the extent possible

④ To meet the demand of the SEZ, develop the infrastructure as an off-site system of high performance & low environmental impact

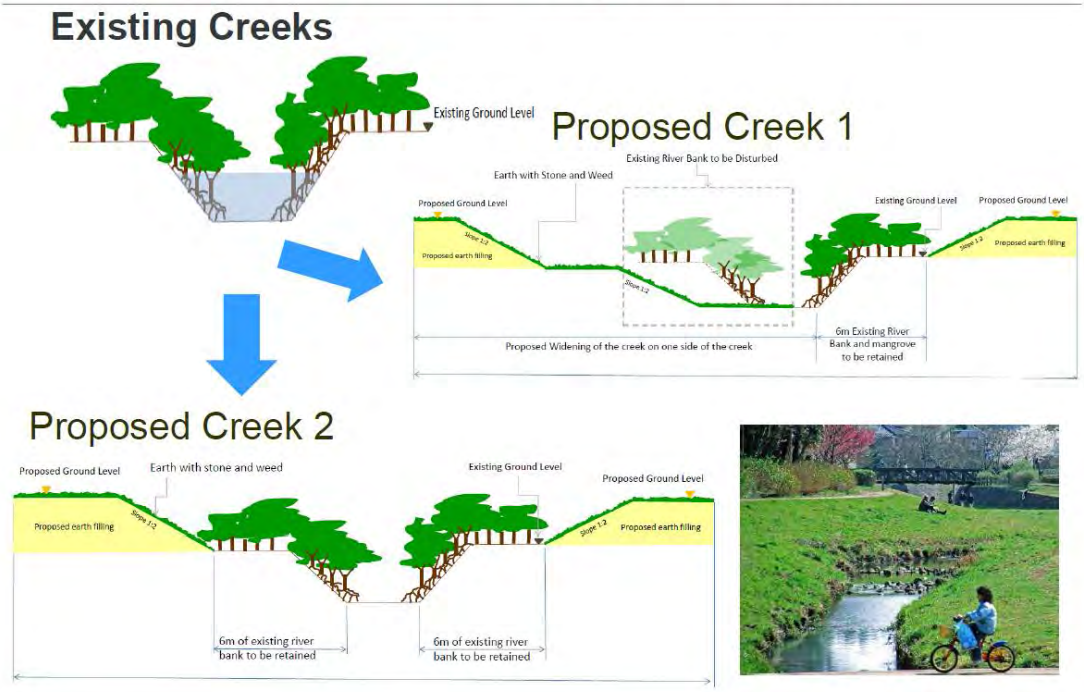
⑤ Apply Eco-Smart technology that can reduce the load on the environment & households.

6. Development Scenario - Key Point 1: Excluded Area

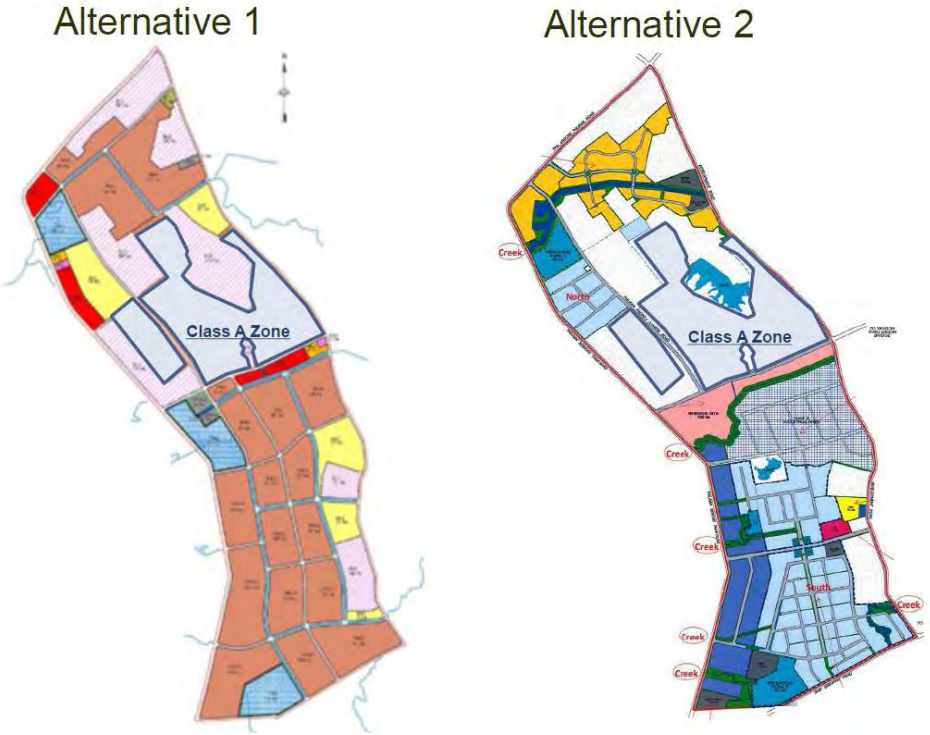
Need to confirm the area.



7. Development Scenario - Key Point 2: Creek



7. Development Scenario - Original Plan -



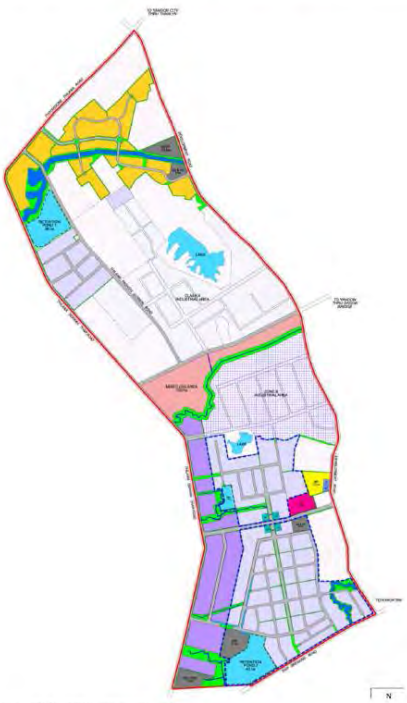
7. Development Scenario - Alternative Plan -

Major Items	Alternative 1 (Original Plan)	Alternative 2 (Upgraded Plan)
Land Use Plan	Developable Area: 2,376ha Industrial Area: 1,554ha	Developable Area: 2,120ha Industrial Area: 1,119ha
Natural Environment		
Ecosystem	There is a risk of Mangrove habitat (Water streams)	Mangrove habitats (Water streams) will remain. One pond located next to the monastery in the center of the project site will remain.
Hydrology (Flood Control)	Three Retention ponds are to be constructed. Main streams will be altered to concrete water channel.	Three Retention ponds are to be constructed. Main streams will be expanded to allow more flow rate, keeping the current routes and ecology
Social Environment		
Resettlement	There are settlers who live in the project site and need relocation.	
Cultural Heritage	There is a risk of Cultural Heritage.	Cultural Assets are avoided and kept as it is based on the relevant laws and regulations.

7. Development Scenario – Stakeholder's Comments

	Comment received	Response
General	What is the difference between an EIA and an SEA ?	EIA is a compulsory assessment for all large-scale projects to discuss specific impacts, and SEA is about the strategic thinking of the environmental impacts on a general planning scale.
	Worries about the hydrological pattern of six streams and appealed to manage these properly since many people are relying on them.	All 6 creeks will be kept as is where possible or expanded in an ecological way.
Explanations	Request to disclose the survey report to local people at the same time of submitting to the authorities.	Final report will be publicized on the internet and distribution of paper copies at the GAD offices in Thanlyin and Kyauktan at the same timing.
Anti-pollution Measures	How TSEZMC measure air pollution and water pollution?	During project construction and operation, further data will be collected on an ongoing basis to compare against the baseline data.
	What is the plan for reporting environmental findings during the operation period for the entire SEZ?	According to the EMP, environmental management group/persons (assigned by TSEZMC) need to release the environmental monitoring reports once yearly to interested stakeholders.
Natural Environment	Included a biodiversity management plan in the EMP	Biodiversity management plan will be included as part of the EMP.
Social Environment	Request for training opportunities for local people in new industries since most are very poor and have a low level of education.	SEZ Management Committee will choose business types to operate in the economic zone while prioritizing those that bring in good employment opportunities. There is an arrangement to offer vocational training, too.

7. Development Scenario - Land Use



- Overall SEZ Boundary (2887ha)
- Bonded Zone
- M — Commercial / Administrative
- General Industry
- Logistics
- Residential
- WD — Residential (Workers Dormitory)
- Mixed Use Area
- Green & Open Space
- CP — Customs Checkpoint
- CD — Civil Defense
- P — Polyclinic
- Waterbody - Retention Pond / Lake
- Waterbody - Rivers & Creeks
- Waterbody - Drainage Reserve
- Utility
- Roads
- Exclusion Area
- Class A Industrial Area
- Zone B Industrial Area (266 ha)

8. Possible Constraints in Development Phase

1) Protecting the natural environment

- Loss of mangrove
- Loss of natural habitat for fish and birds
- Possibility of floods

2) Reducing impacts on local people

- Impacts on Livelihood of Farmers and Fishermen
- Impacts on Cultural Assets/ Adjacent Villages/ Universities, Community Facilities in Excluded Areas and surrounding areas, etc.
- Impacts related to HIV/AIDs and communicable disease

9. Operational Scenario

Potential Industrial Sectors
[Demand in Class A]

REPLACE WITH INFO FROM DR. THAN THAN.

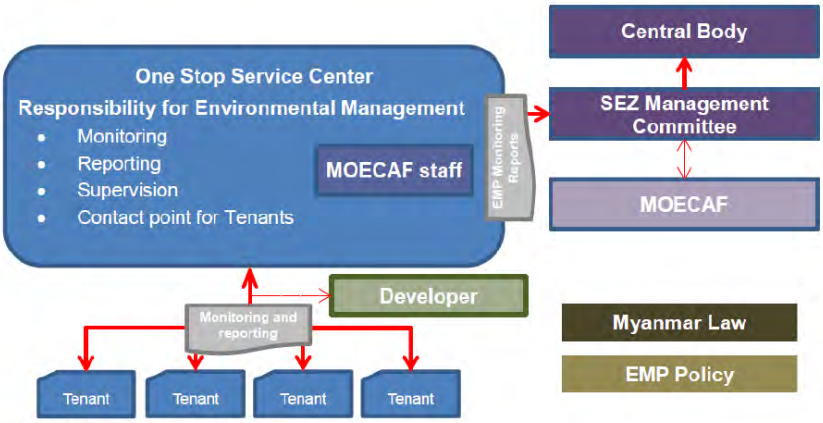
10. Possible Contraints in Operation Phase

Controlling Impacts/Pollutants

- Impact on water resources (streams/rivers)
- Impact on ambient Air, noise & vibration
- Generation of waste (organic and industrial)
- Impacts related to Land Subsidence due to the use of underground water
- Impacts on fauna & flora (pollution in soil and water environment)
- Social Impacts such including safety, landscape, community and so on
- Resettlement work plan prepared separately
- Complaints from the surrounding communities and others with grievance mechanism via GAD
- Response to the local authorities, change in environmental and social laws and regulations

11. Environment Management

One-Stop Service Center will be responsible for Environment Management and manage EIA.



Note: O&M=Operation and Management
Source: SEZ Management Committee

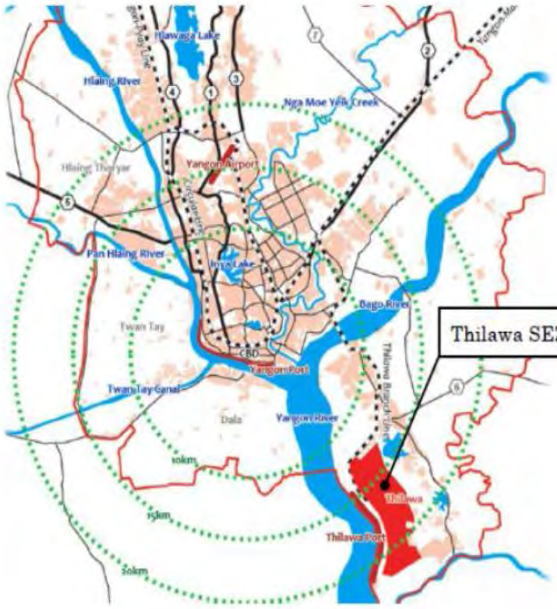
Thank you!

General stakeholder comments can be directed to:
Thilawaygn@gmail.com (SEZ Management Committee)

2. An Burmese Version of Presentation given at the Stakeholder Meeting[1]

[1] Note: Legend in page 12 of this PPT was shown in English but explained in Myanmar language at the stakeholder meeting.

၁) စီမံကိန်းဖော်ပြချက်



စီမံကိန်းရည်ရွယ်ချက်

သီလဝါအထူးစီးပွားရေးဇုန်ဖွံ့ဖြိုးတိုးတက်စေရန်

စီမံကိန်းတည်နေရာ

ရန်ကုန်မြို့၏ အရှေ့တောင်ဘက် ကီလိုမီတာ (၂၀) အကွာအဝေးရှိ သံလျင်နှင့် ကျောက်တန်းမြို့နယ်များအတွင်း

စီမံကိန်းအဆိုပြုသူ

သီလဝါအထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ

၂) မဟာဗျူဟာမြောက်ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းနည်းလမ်း

စီမံကိန်းနှင့် သက်ဆိုင်သူများကိုသတ်မှတ်ခြင်း

စီမံကိန်းမစတင်မီအခြေအနေ (သတိထားဆောင်ရွက်ရမည့်အကြောင်းကိစ္စများ)

ဥပဒေဆိုင်ရာ မူဘောင်/ ကန့်သတ်ချက်

စီမံကိန်းအတွက် စစ်ဆေးရန် အချက်အလက်ရေးဆွဲခြင်း

ဖွံ့ဖြိုးရေးဆိုင်ရာ အနာဂါတ်မျှော်မှန်းချက်

ဖြစ်ပေါ်လာနိုင်သည့် ထိခိုက်သက်ရောက်မှုများ

ထိခိုက်သက်ရောက်မှုများအတွက် လျော့ချရေး အစီအမံများ

ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုဆန်းစစ်လေ့လာခြင်း

၃) စီမံကိန်းမစတင်မီအခြေအနေ (သတိထားဆောင်ရွက်ရမည့်အကြောင်းကိစ္စများ)

◆ <u>သဘာဝ ပတ်ဝန်းကျင်</u>

- သဘာဝ ပတ်ဝန်းကျင် အမျိုးအစား (ဒီရေတော၊ ချောင်း၊ မြောင်း၊ ကန် များ)
- ကာကွယ်ထားသော ရှားပါး တိရစ္ဆာန်များ
- ရန်ကုန်မြစ်၊ မော်ဝန်းမြစ်
- စမ်းချောင်းများ၊ ရေလှောင်တမံများ၊ ရေကန်ငယ်များ

◆ <u>လူမှု ပတ်ဝန်းကျင်</u>

- ငါးလုပ်ငန်းနှင့် စိုက်ပျိုးရေးလုပ်ငန်းများ
- စီမံကိန်းနယ်မြေ၏ အနီးပတ်ဝန်းကျင်ရှိ အရေးပါသော/ သတိထားဆောင်ရွက်ရမည့် ဇရိယာများနှင့်ပိုင်ဆိုင်မှုများ
  - ယဉ်ကျေးမှုဆိုင်ရာ အမွေအနှစ်ပစ္စည်းများ (စေတီ၊ ဟိန္နျဘုရားကျောင်း စသည် ...)
  - တည်ရှိပြီးဖြစ်သော အဆောက်အဦများ (တက္ကသိုလ်များ၊ ရပ်ရွာအခြေပြု အခြား အထောက်အကူပြု ပစ္စည်းများ)
  - အနီးဝန်းကျင်ရှိ ကျေးရွာများ

၄) ဥပဒေဆိုင်ရာ မူဘောင်/ ကန့်သတ်ချက်

[EIA / SIA ဆိုင်ရာ ဥပဒေနှင့် လုပ်ထုံးလုပ်နည်းများ]

- ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂) နှင့် ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးနည်းဥပဒေများ (၂၀၁၄)
- ပတ်ဝန်းကျင် ထိခိုက်မှု ဆန်းစစ်ခြင်းလုပ်ငန်း **လုပ်ထုံးလုပ်နည်းများ** (မူကြမ်းအဆင့်)

⇒ မြန်မာနိုင်ငံတွင် ပတ်ဝန်းကျင်ဆိုင်ရာ စံချိန်စံညွှန်း/ လမ်းညွှန်ချက်များ/ လုပ်ထုံးလုပ်နည်းများ တိတိကျကျ သက်မှတ်ထားခြင်း မရှိသေးပါ။

⇒ ပတ်ဝန်းကျင်ဆိုင်ရာ စံချိန်စံညွှန်း များလုပ်ဆောင်ဆဲ ကာလ

[အခြား နည်းဥပဒေနှင့် လုပ်ထုံးလုပ်နည်းများ]

- မြန်မာအထူးစီးပွားရေးဇုန်ဥပဒေ (၂၀၁၄) (ရင်းနှီးမြှုပ်နှံသူများသည် နိုင်ငံတကာ စံသတ်မှတ်ချက်များနှင့်အညီ လိုက်နာဆောင်ထိန်းရမည်။)
- IFC EHS Guidelines ပတ်ဝန်းကျင်ဆိုင်ရာ စံချိန်စံညွှန်းများအား ယာယီသတ်မှတ် ဆောင်ရွက်ထားပါသည်။

၅) ဖွံ့ဖြိုးတိုးတက်မှုဆိုင်ရာအယူအဆ - METI Study -

၁) တန်ဘိုးမြင့် ထုတ်ကုန်ပစ္စည်းများနှင့် မြန်မာနိုင်ငံအမှတ် တံဆိပ်ထုတ်ကုန်ပစ္စည်းများ တိုးမြှင့်ထုတ်လုပ်လာစေရန်၊ ကုန်ထုတ်လုပ်ငန်း၊ ပညာရေး၊ သုတေသနနှင့်ဖွံ့ဖြိုးရေးလုပ်ငန်း များ တိုးတက်လာစေရန်၊

၂) သီလဝါအထူးစီးပွားရေးဇုန်အား လူအများ အလုပ်သွားရောက် လုပ်ကိုင်လိုသည့် နေရာတစ်ခုအဖြစ်သာမက အနာဂါတ်ကာလ တွင် အခြေချနေထိုင်လိုသည့် နေရာတစ်ခုအဖြစ် အကောင် အထည်ဖော်ရန်၊

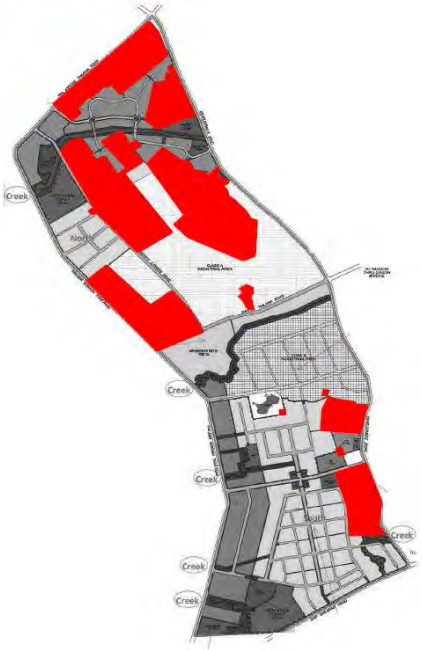
၃) ပတ်ဝန်းကျင်သာမက ဒေသခံများ၊ တည်ရှိပြီး လမ်းများနှင့် မြစ်ချောင်းအင်းအိုင်များအား တတ်နိုင်သမျှ ထိန်းသိမ်းထားနိုင်သည့်ပြင် ကျန်းမာရေးနှင့်ညီညွတ်မှုတာပြီး ပြည့်စုံသည့် မြို့ပြ လူနေမှုဘဝအား တည်ဆောက်ရန်၊

၄) သီလဝါ အထူးစီးပွားရေးဇုန်၏ ကြိုးပမ်း အားထုတ်မှု ဖြစ်သော အခြေခံအဆောက်အအုံ တည်ဆောက်ရာတွင် စွမ်းဆောင်ရည် အမြင့်မားဆုံးရရှိရန်နှင့် ပတ်ဝန်းကျင် ထိခိုက်နိုင်မှု နည်းနိုင်သမျှ နည်းရန် Off-site System (ဥပမာ- စီမံကိန်းတည်နေရာမှ ဝေးကွာသည့် အခြားတစ်နေရာတွင် အညစ်ကြေး/ရေဆိုး စသည်ဖြင့် - တို့အား ပြန်လည်သန့်စင်သည့် စနစ်) အား ဖြည့်ဆည်းပေးရန်၊

၅) ဂေဟစနစ် ထိန်းသိမ်းခြင်း နည်းပညာ (Eco- Smart Technology) များကို အသုံးပြုခြင်းဖြင့် သဘာဝပတ်ဝန်းကျင်နှင့် လူသားများအား ထိခိုက်မှုနည်းစေရန်၊

၆) ဖွံ့ဖြိုးရေးဆိုင်ရာ အနာဂါတ်မျှော်မှန်းချက် - အဓိကအချက် ၂ မူလစီမံချက်

ဇရိယာသတ်မှတ်ချက်

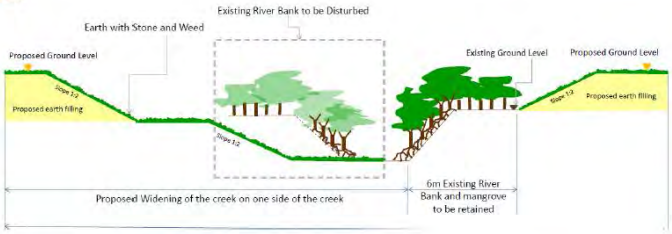


စီမံကိန်းနှင့် မသက်ဆိုင်သော ဇရိယာ

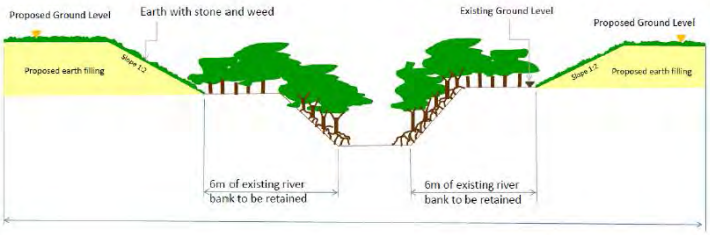
၆) ဖွံ့ဖြိုးရေးဆိုင်ရာ အနာဂါတ်မျှော်မှန်းချက် -အဓိကအချက် (၂): ချောင်းငယ်

တည်ရှိဆဲချောင်း

ဆောင်ရွက်မည့် ချောင်းငယ်အနေအထား (၁)



ဆောင်ရွက်မည့် ချောင်းငယ်အနေအထား (၂)



၆) ဖွံ့ဖြိုးရေးဆိုင်ရာ အနာဂါတ်မျှော်မှန်းချက် - မူလစီမံချက်

အခြားရွေးချယ်နိုင်သည့်နည်းလမ်း (၁)

အခြားရွေးချယ်နိုင်သည့်နည်းလမ်း (၂)

၆) ဖွံ့ဖြိုးရေးဆိုင်ရာ အနာဂါတ်မျှော်မှန်းချက် - အခြားစီမံချက်နည်းလမ်းများ

အဓိကအကြောင်းအရာ	နည်းလမ်း(၁) (မူလစီမံချက်)	နည်းလမ်း(၂) (အဆင့်မြှင့်စီမံချက်)
မြေအသုံးချမှု အစီအစဉ်	ဆောင်ရွက်မည့်ဧရိယာ - ၂,၃၇၆ ဟက်တာ စက်မှုနယ်မြေဧရိယာ - ၁,၅၅၄ ဟက်တာ	ဆောင်ရွက်မည့်ဧရိယာ- ၂,၁၂၀ ဟက်တာ စက်မှုနယ်မြေဧရိယာ - ၁,၁၁၉ ဟက်တာ
သဘာဝပတ်ဝန်းကျင်		
ဂေဟစနစ်	ဒီရေတောတည်ရာ (ချောင်းများ) အနည်းငယ်ထိခိုက်နိုင်ပါသည်။	ဒီရေတောတည်ရာ (ချောင်းများ) ကျန်ရှိမည် ဖြစ်ပါသည်။ စီမံကိန်းဧရိယာ အလယ်ဗဟိုရှိ ဘုန်းကြီးကျောင်းနှင့် ကပ်လျက်တည်ရှိသော ရေကန်မှာလည်း နဂိုမူလအတိုင်း ကျန်ရှိမည် ဖြစ်ပါသည်။
ရေလှောင်ရေဝေစနစ် (Hydrology) (ရေကြီးခြင်း/ ရေလွှမ်းမိုးခြင်း ထိန်းချုပ်ခြင်း)	ရေထိန်းကန်(၃)ခုတူးဖော်၍ အဓိကရေနုတ်မြောင်းများအား ကွန်ကရစ်မြောင်းများ အဖြစ် ပြောင်းလဲတည်ဆောက်သွားမည် ဖြစ်ပါသည်။	ရေထိန်းကန်(၃)ခု တူးဖော်၍ အဓိက ရေနုတ်မြောင်းများအား ရေစီးရေလာပိုမိုကောင်းမွန်စေရန် မြောင်းအကျယ်အား တိုးချဲ့ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ထိုသို့တိုးချဲ့ဆောင်ရွက်ရာတွင် ဂေဟစနစ် ထိန်းသိမ်းသည့်အနေဖြင့် မူလလမ်းကြောင်းအတိုင်း တည်ဆောက်သွား မည်ဖြစ်ပါသည်။
လူမှုပတ်ဝန်းကျင်		
ပြောင်းရွှေ့နေရာချထားခြင်း	စီမံကိန်းနေရာရှိ မူလနေထိုင်သည့် ဒေသခံများအား ပြန်လည်နေရာချထားပေးရန် လိုအပ်ပါသည်။	
ယဉ်ကျေးမှုအမွေအနှစ်	ယဉ်ကျေးမှုအမွေအနှစ်အား အနည်းငယ်ထိခိုက်နိုင်ပါသည်။	ယဉ်ကျေးမှုအမွေအနှစ်များအား ချန်လှပ်၍ တည်ဆဲဥပဒေ၊ လုပ်ထုံးလုပ်နည်းများနှင့်အညီ ထိန်းသိမ်းဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

၆) ဖွံ့ဖြိုးရေးဆိုင်ရာ အနာဂါတ်မျှော်မှန်းချက် -တတ်ရောက်သူများ၏ သဘောထားမှတ်ချက်

	သဘောထား	ပြန်လည်ဖြေကြားမှုများ
အထွေထွေ	EIA နှင့် SEA ကွာခြားချက်ကို ဖော်ပြပါ။	EIA ဆိုသည်မှာ စီမံကိန်းများ၏ ဖြစ်ပေါ်လာနိုင်သော အကျိုးဆက် အတွက် စစ်ဆေးခြင်း၊ SEA ဆိုသည်မှာ ဖြစ်ပေါ်လာနိုင်သော ထိခိုက်မှုများကို မဟာဗျူဟာမြောက် ဆန်းစစ်လေ့လာခြင်း ဖြစ်ပါသည်။
	လူအများစု မှီခိုနေရသော ချောင်းငယ် (၆) ခု အပေါ် စိုးရိမ်မှုများရှိပါသည်။	ချောင်းငယ် (၆) ခုလုံးကို ကာကွယ်မှုများ ပြုလုပ်သွားပါမည်။
ရှင်းလင်းချက်	ဒေသခံပြည်သူများအား စစ်ဆေးတွေ့ရှိချက် အစီရင်ခံစာ ကို ရှင်းလင်းပြစေချင်ပါသည်။	နောက်ဆုံးအစီရင်ခံစာကို သီလဝါအထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီဂက်ဆိုက်မှလည်းကောင်း၊ သံလျင်နှင့် ကျောက်တန်းမြို့နယ်များမှ အုပ်ချုပ်ရေးမှူးရုံး သို့ ဖြန့်ဝေပေးသွား ပါမည်။
ညစ်ညမ်းမှုတားဆီးမှုများ	TSEZMC လေနှင့် ရေ ညစ်ညမ်းမှုများကို ဘယ်လို တိုင်းတာပါသလဲ။	စီမံကိန်းပြုလုပ်နေစဉ်အတွင်း ရရှိလာသော အချက်အလက် များနှင့် မူရင်း အချက်အလက်များကို နှိုင်းယှဉ်မှုများ ပြုလုပ်သွားမည်။
	စီမံကိန်းလုပ်ဆောင်နေစဉ်အတွင်း ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုများအတွက် အစီအမံရှိပါသလား။	EMP အရ၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအဖွဲ့များမှ တစ်နှစ်အတွင်း အစီရင်ခံစာများကို စိတ်ဝင်စားသော ပြည်သူများထံသို့ ထုတ်ပြန်ပေးသွားမည်။
သဘာဝပတ်ဝန်းကျင်	EMP တွင် biodiversity management plan ပါဝင်ပါ သလား။	EMP တွင် biodiversity management plan အစိတ်အပိုင်း တစ်ခုအနေဖြင့် ပါဝင်ပါဝင်ပြီမှာမယ်။
လူမှုပတ်ဝန်းကျင်	ဒေသခံပြည်သူများမှာ အသိပညာ နည်းပါးသောကြောင့် စက်ရုံနှင့်ပက်သက်သော သင်တန်းများများ ပြုလုပ်ပေးစေချင်ပါသည်။	SEZ စီမံခန့်ခွဲရေး ကော်မတီမှ အလုပ်အကိုင်အခွင့်အလမ်းအတွက် စီးပွားရေးဇုံအလိုက် ဦးစားပေးရွေးချယ်သွားမည်ဖြစ်ပြီး သင်တန်းများ အတွက်လည်း စီစဉ်ပေးသွားမည် ဖြစ်ပါသည်။

၆) ဖွံ့ဖြိုးရေးဆိုင်ရာ အနာဂါတ်မျှော်မှန်းချက် - မြေအသုံးချမှု

၇) အဓိကကြုံတွေ့နိုင်သည့် ပတ်ဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုများ

၁) သဘာဝ ပတ်ဝန်းကျင်ကို ကာကွယ်ခြင်း

- ဒီရေတော ပျက်ဆီးဆုံးရှုံးမှု၊
- ငါးနှင့် ငှက်တို့ နေထိုင်ရာနေရာများ ပျောက်ဆုံးမှု၊
- ရေလွှမ်းနိုင်မှု၊

၂) ဒေသခံပြည်သူများအတွက် ထိခိုက်မှုများ လျော့ချခြင်း

- လယ်သမား နှင့် ငါးဖမ်းသမားတို့အပေါ် ထိခိုက်မှုများ၊
- စီမံကိန်း ပတ်လည်ရှိ ဇရိယာအတွင်းရှိ ယဉ်ကျေးမှုအဆောက်အဦးများ၊ အနှီးအနာရှာများ၊ တက္ကသိုလ်များ၊ အများပိုင်အဆောက်အဦးများ၊
- HIV/AIDs နှင့် ပြန့်ပွားနိုင်သော ရောဂါများ၊

၈) အနာဂါတ်တွင်ဖြစ်နိုင်ခြေရှိသော စီးပွားရေးလုပ်ငန်းများ

<u>စက်မှုကဏ္ဍဖွံ့ဖြိုးတိုးတက်နိုင်မှုအလားအလာ</u>

<u>(CLASS A ၏အတွေ့အကြုံအရ)</u>

❑ ကုန်ထုတ်လုပ်ငန်း

အဝတ်အထည်လုပ်ငန်း၊
စားသောက်ကုန်လုပ်ငန်း၊ ပလပ်စတစ်လုပ်ငန်း၊
အစားအစာနှင့်ဆက်စပ်ပစ္စည်းလုပ်ငန်း၊
ဆေးဝါးနှင့်ဆေးဝါးပစ္စည်းလုပ်ငန်း၊ ကားနှင့်
ကားပစ္စည်းလုပ်ငန်း

❑ ဝန်ဆောင်မှုလုပ်ငန်း

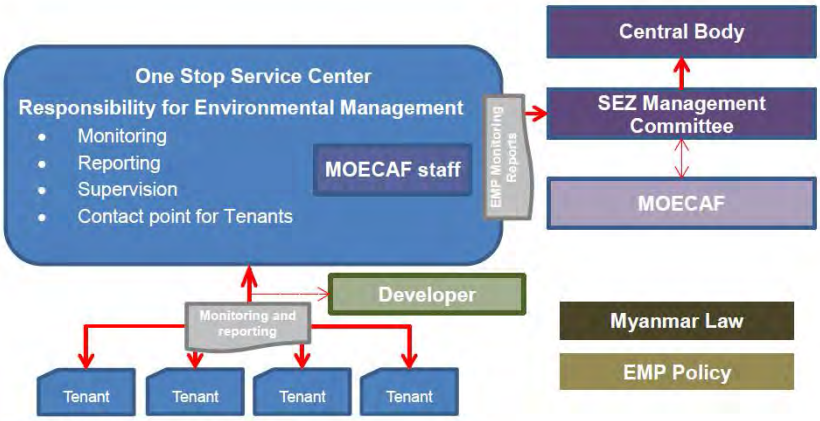
ပို့ဆောင်ရေးနှင့် လမ်းပန်းဆက်သွယ်ရေး
ဆိုင်ရာပစ္စည်းများဖြန့်ဝေခြင်း

၉) အဓိကကြုံတွေ့နိုင်သည့် ပတ်ဝန်းကျင်ထိခိုက်မှုများ

- ရေအရင်းအမြစ်များအပေါ် ထိခိုက်သက်ရောက်မှုများ (မြစ်ချောင်းများ)၊
- ပတ်ဝန်းကျင် လေထုအပေါ် သက်ရောက်မှုများ၊ ဆူညံသံနှင့် တုန်ခါမှုများ၊
- တိုးတက်ဖြစ်ပေါ်လာမည့် စွန့်ပစ်ပစ္စည်း၊
- မြေအောက်ရေ ထုတ်ယူသုံးစွဲမှုကြောင့် မြေလွှာ အောက်သို့ နိမ့်ကျခြင်း များကဲ့သို့သော ထိခိုက်မှုများ၊
- မြေဆီလွှာနှင့် ရေ ညစ်ညမ်းမှုများကြောင့် အပင်နှင့် သားငှက်တိရစ္ဆာန်များ အပေါ် ထိခိုက်မှုများ၊
- ဘေးအန္တရာယ်ကင်းရှင်းခြင်း၊ ဥယျာဉ်ပန်းမာန်နှင့် လူမျိုးစုများ၏အကျိုးစီးပွား အပေါ် ထိခိုက်မှုများ၊
- ပြန်လည်နေရာချမှုများ၊
- ပတ်ဝန်းကျင် လူမှုအဖွဲ့အစည်းများနှင့် အခြားသူများ၏ သဘောထား ကွဲလွဲမှုများ၊
- ဒေသတွင်း တာဝန်ရှိပုဂ္ဂိုလ်များအပေါ် တုန့်ပြန်မှု၊ ပတ်ဝန်းကျင်ဆိုင်ရာနှင့် လူမှုရေးဆိုင်ရာ ဥပဒေများ၊ နည်းဥပဒေများ ပြောင်းလဲလာမှု၊

၁၀) ပတ်ဝန်းကျင်ဆိုင်ရာ စီမံခန့်ခွဲမှု

OSSC (One Stop Service Center) သည် ပတ်ဝန်းကျင်ဆိုင်ရာထိခိုက်မှုဆိုင်ရာ စီမံခန့်ခွဲမှုများအား ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။



Note: O&M=Operation and Management
Source: SEZ Management Committee

ကျေးဇူးတင်ပါသည်။

ထပ်မံဆွေးနွေးလိုသောအချက်များ၊ အကြံဉာဏ်များနှင့် သုံးသပ်ချက်များအား အောက်ဖော်ပြပါ အီးလ်မေးသို့ (၃၀-၉-၂၀၁၅) ထိနောက်ဆုံးထား၍ပေးပို့နိုင်ပါသည်။

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(သီလဝါ အထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ)

3. Attendance List

① Morning Session

Government Department

No	Name	Position	Department
1	Daw Win Win Hlaing	Deputy Director	Factory and Labour
2	Dr Than Aug	Secretary	TSEZ MC
3	U Zaw Moe	Deputy Director	MOECAF
4	U Sal Maung	Staff Officer	Drainage and Irrigation
5	Daw Ei Ei Mon	Environmental Expert	TSEZ-MC
6	U Khin Maung Tin	Assistant Administrator	TSEZ, OSSC
7	U Aung Than Zaw	-	Development Supporting
8	U Kyaw Lwin	Hundred Household Head	-
9	U Mya San	Hundred Household Head	-
10	U Ngal	Hundred Household Head	-
11	U Tin Aye	Hundred Household Head	-
12	U Myint Aung	Hundred Household Head	-
13	U Aung Phay Lwin	Deputy Lecturer	-
14	Dr Ngwe Ngwe Lwin	Deputy Rector	Cooperative University (Thanlyin)
15	U Aung Myint	Staff Officer	
16	Dr Khine Moe Aye	Deputy Staff Officer	VET Department
17	U Khin Maung Swe	Deputy Staff Officer	Land Survey Department
18	U Thay Shwe	Staff Officer	Fire Force
19	U Ye Min Htun	District Staff Officer	Fire Force
20	U Ohn Minn Aung	-	YCDC
21	Dr. Thein Htun	Rector	Cooperative University (Thanlyin)
22	Daw Yuzana Hlaing	-	Myanmar Economic Cooperation (Zinc Factory Thanlyin)
23	U Tay Aung	Staff Officer	Agricultural Department Thanlyan
24	Daw Khin Marlar Aung	-	Agri/ Bank
25	Daw Myint Myint Than	Staff Officer	Cooperative
26	Daw Yee Yee Than	Township Officer	Traditional Medicine

27	Daw Khin Ma Ma	Staff Officer	Project Implementation
28	U Khin Maung Than	Staff Officer	Immigration (Thanlyin)
29	U Myo Lwin	E.I	Human Settlement and Housing Development
30	Dr Than Than Thwe	Joint Secretary	TSEZ MC
31	Daw Mya Myat Chal	S.A.E	TSEZ OSSC
32	U Khin Maung Tin	A.D	TSEZ OSSC
33	U Saw Ba Hein	Staff Officer	Forest Department
34	U Bwe Kyone		YCDC PCCD
35	U Htun Htun Thaung		YCDC PCCD

Private Company

No	Name	Position	Company
1	Daw Thwe Thwe Myat Aung	Assistant Manager	Myanmar Japan Thilawa Development(MJTD)
2	Naoko Maruyama		ERM Japan
3	Sadamitsa Sakoguchi		ERM Japan
4	Shinichi Tsunida		Miznbo Bank
5	U Aung Lwin	Interpreter	JICA Study Team
6	U Than Win Aung	MD	Pale Nadi
7	U Khin Lay	Director	Pale Nadi
8	Daw May Than Zin	Manager	Oji
9	Daw Pan Ei Phyu	Assistant Manager	Oji

Local People

No	Name	Address	Position
1	Daw Yin Yin Mar	Alwansweet	Mason worker
2	U Zaw Lwin Htet	Shwe Pyi Thar	Mason worker
3	U Khin Than	Alwansweet	Farmer
4	U Than Zaw	Alwansweet	Contract
5	U Nay Win Aung	Alwansweet	Casual
6	U Aye	Phayar Kone	-
7	U Hla Aye	Phayar Kone	-
8	U Hla Naing Oo	Alwansweet	Carpenter
9	Daw Cho	Alwansweet	Farmer

10	U Thar Cho	Alwansweet	Casual
11	U Kyaw Linn Naing	Alwansweet	Mason worker
12	U Maung Maung Win	Thidar Myaing	Farmer
13	U Maung Htwe	Alwansweet	Driver
14	U Than Htwe	Alwansweet	-
15	U Myint Kyi	Alwansweet	Farmer
16	U Ye Lwin	Alwansweet	Construction
17	Daw Hla Hla Aye	Alwansweet	Casual
18	Daw Aye Hlaing	Alwansweet	Casual
19	U Kan Shwe	Alwansweet	Mason worker
20	U Kyi Aye	Alwansweet	Mason worker
21	U Ko Ko Aung	Alwansweet	Mason worker
22	U Ko Ko Aung	Alwansweet	Mason worker
23	U Zaw Min Hlaing	Thidar Myaing	Farmer
24	U Kyaw Kyaw	Thidar Myaing	Farmer
25	U Zay Yar	Thidar Myaing	Farmer
26	U Hla Myint	Rice Mill	Casual
27	U Aye Kyu	Latt Yat San	Administrator
28	U Kyaw Soe	Latt Yat San	Chairman
29	U Myint Oo	Latt Yat San	Hundred Household Head
30	U Htun Win	Latt Yat San	Hundred Household Head
31	U Thant Zaw	Latt Yat San	Hundred Household Head
32	U Thein Hlaing	Latt Yat San	Hundred Household Head
33	U Nyunt Win	Latt Yat San	Hundred Household Head
34	U Kyaw Thu	Latt Yat San	Hundred Household Head
35	U Aung Htay	Kyaung Kone Sate Gyi	Trade
36	U Thein Aung	Kyaung Kone Sate Gyi	Trade
37	U Myint Naing	Kyaung Kone Sate Gyi	-
38	U Zaw Aye	Kyaung Kone Sate Gyi	-
39	U Kyi Than	Kyaung Kone Sate Gyi	Farmer
40	U Kyaw Zaya	Alwansweet	Farmer
41	Daw Than Than Yee	Alwansweet	Farmer
42	U Tin Htay	Alwansweet	Farmer
43	U Thet Kyaing	Latt Yat San	Hundred Household Head
44	U Htin Linn Kyaw	Latt Yat San	Hundred Household Head

45	Daw Mya Sein	Alwansweet	Dependant
46	Daw Lone Kyal	Alwansweet	Dependant
47	Daw Win	Alwansweet	Dependant
48	U Khin Maung Myint	Alwansweet	Casual
49	U Kyaw Linn	Alwansweet	Casual
50	U Thein Zaw	Alwansweet	Farmer
51	U Win Soe	Alwansweet	Farmer
52	U Kan Win	Alwansweet	Dependant
53	U Ko Ko Latt	Alwansweet	Dependant
54	U Than Win Aung	Alwansweet	Carryer
55	U Bo Htun	Alwansweet	Seller
56	U Tin Nyunt	Alwansweet	Construction
57	U Myint Hlaing	Kyaung Kone Sate Gyi	Administrator
58	U Htain Linn	Alwansweet	Administrator
59	Daw Khin Aye Kyu	Alwansweet	Dependant
60	Daw Hla Moe	Alwansweet	Dependant
61	U Kyi Lwin	Alwansweet	Casual
62	U Thein Aung	Alwansweet	Construction
63	Daw Ohn	Alwansweet	Dependant
64	U Aye Htay	Thidar Myaing	Farmer
65	U Mya Thaung	Thidar Myaing	Farmer
66	U Hla Myo Htun	Alwansweet	Casual
67	U Linn Linn Bo	Kyaung Kone Sate Gyi	Hair Sloon
68	U Win Mg Mg Lwin	Kyaung Kone Sate Gyi	Hair Sloon
69	U Myo Shwe	Alwansweet	-
70	U Kyaw Win	Alwansweet	Casual
71	U Kyaw Than	Alwansweet	Farmer
72	U Aung Ko Ko	Alwansweet	Mason worker
73	U Than Aung	Alwansweet	Farmer
74	U Tin Oo	Rice Mill	Hair Sloon
75	Daw Thin Thin Khine	Alwansweet	Farmer
76	U Aung Linn	Alwansweet	Mason worker
77	U Htun Win	Alwansweet	Carpenter
78	U Zaw Htike Win	Alwansweet	Carpenter
79	U Myint Naing	Thidar Myaing	Carpenter

80	U Thein Zaw	Thidar Myaing	Carpenter
81	U Zaw Win	Thidar Myaing	Carpenter
82	U Thein Naing Oo	Alwansweet	Driver
83	Daw Cho Cho Oo	Alwansweet	Farmer
84	Daw Thwe Thwe Win	Alwansweet	Dependant
85	Daw Aye Aye Aung	Alwansweet	Seller
86	Daw Nwet Nwet Win	Alwansweet	Dependant
87	U Kyaw Win Htun	Alwansweet	Farmer
88	U Aye Zaw	Alwansweet	Farmer
89	U Aung Ko Min	Alwansweet	Casual
90	Daw Kathi Oo	Shwe Pyut Village	Dependant
91	U Tin Oo	Rice Mill	Carpenter
92	Daw April Moe	Alwansweet	Dependant
93	Daw Yee Yee Than	Alwansweet	Dependant
94	U Han Nyein	Alwansweet	Trade
95	U Maung Cho	-	Farmer
96	Daw Thuzar Minn	Shwe Pyut Village	Seller
97	U Zaw Hein Latt	Shwe Pyut Village	Causal
98	U Lay Lwin	Alwansweet	Farmer
99	U Hla Kyi	Alwansweet	Farmer
100	U Maung San	Alwansweet	Farmer
101	U Htay Lwin	Alwansweet	Farmer
102	U Than Htike	Alwansweet	Mason worker
103	U Aung Thu	Alwansweet	Farmer
104	U San Win	Thidar Myaing	Farmer
105	U Myo Zaw Oo	Alwansweet	Seller
106	Daw Kay Thi	Alwansweet	Casual
107	Daw Mi Ngal	Alwansweet	Seller
108	U Kyaw Soe	Alwansweet	Driver
109	U Soe Thein	Alwansweet	Livestock
110	Daw Khin Sint	Alwansweet	Farming
111	U Sein Win	Alwansweet	Carry
112	Daw Than Sint	Alwansweet	Dependant
113	Daw Hla Oo	Alwansweet	Dependant
114	U Zaw Naing Htun	Kyaung Kone Sate Gyi	Company

115	U Thaung Kyi	Kyaung Kone Sate Gyi	Seller
116	U Aye Thein	Kyaung Kone Sate Gyi	Seller
117	U Soe Naing	Kyaung Kone Sate Gyi	-
118	U Myint Shwe	Aye Mya Thidar	Farmer
119	U Kyaw Thu Htwe	Kyaung Kone Sate Gyi	-
120	U Aye Cho	Kyaung Kone Sate Gyi	Chairman
121	Daw Yee Yee Mya	Alwansweet	Dependant
122	U Than Maung	Alwansweet	Farmer
123	U Ba Tin	Alwansweet	Carpenter
124	U Myint Gyi	Alwansweet	-
125	U Maung Aye	Alwansweet	Mason worker/ Carpenter
126	U Win Aung	Alwansweet	Farmer
127	U Ngwe Win	Alwansweet	Farmer
128	U Zaw Oo	Alwansweet	Farmer
129	Daw Yin Shwe	Alwansweet	Cement Factory
130	Daw Ohn Than	Alwansweet	Seller
131	U Than Maung Maung	Alwansweet	Farmer/ Seller
132	U Thant Zin	Alwansweet	Farmer
133	U Han Sein	Alwansweet	Carry
134	Daw San Maw	Alwansweet	Farmer
135	Daw Than Nwet	Alwansweet	Dependant
136	U Thaung Kyi	Alwansweet	Casual
137	U Zaw Min Oo	Alwansweet	Carry
138	U Thein Zaw	Kyauk Kone	Farmer
139	Daw Mee Mee	Alwansweet	Casual
140	Daw Mya Win	Alwansweet	Casual
141	Daw Linn Linn Sein	Alwansweet	Farmer
142	U Thein Yu	Alwansweet	Staff
143	U Thet Naing Myo	Alwansweet	Casual
144	U Maung Zaw	Alwansweet	Carpenter
145	U Thein Linn Aung	Alwansweet	Carpenter
146	U Thein Phay	Alwansweet	Dependant
147	U Soe Maung Maung	Shwe Pyi Thar	Mason worker
148	U Maung Myint	Alwansweet	Seller
149	Daw Thuzar	Shwe Pyut Village	Causal

150	U Moe Kyaw	Alwansweet	Farmer
151	U Aye Lwin	Alwansweet	Carpenter
152	U Thein Aung	Alwansweet	Carpenter
153	U Pan Htike	Alwansweet	Carry

NGO

No	Name	Organization
1	Daw May Zin	Fujita Corporation
2	War War	Fujita Corporation
3	Augustine	ERI
4	Dr Ei Ei Phyoe	Flora Group
5	Daw Hnin Wut Yee	MCRB
6	Daw Hayman Oo	ICJ
7	U Thura Win Htun	MFA
8	U Tun Thura	Flora Group
9	Dr Tint Swe	MSAM
10	Dr Khin Thida Aung	NGO
11	Dr San Kyi	NGO
12	Dr Mac Thi	NGO
13	Dr Tin New	NGO
14	Dr Tin Oo	NGO

Media

No	Name	Position	Media
1	Daw Aye War Hlaing	Staff Officer	MRTV
2	Daw Aye Moe Moe, Aung	Special-1	MRTV
3	U Aung Min Soe	Special-2	MRTV
4	U Thet Ngal	Reporter	Sky Net
5	U Htet Wai Aung	Camera man	Sky Net
6	U Pyae Phyoe Kyaw	Reporter	Union Daily
7	U Zaw Wai	Reporter	Eleven Media
8	Htay Htay	Reporter	Trade Times
9	Daw May Soe	Reporter	Irrawaddy
10	U Pyae Phone Aung	Reporter	MRTV- 4
11	U Zaw Ye Naung	Camera man	MRTV- 4

12	U Arkar	VJ	DVB TV
13	Daw Win Sandar Oo	VJ	Sky Net (NB)
14	Daw Wai Hnin Htut	mntv Reporter	mntv
15	Daw Moe Zaw Htet	Reporter	The Farmer Journal
16	Daw Sulat	Reporter	Myawaddy
17	U Banyar	Reporter	News Watch
18	Daw Su Myat Yadanar	Reporter	MITV
19	U Kyaw Zin Thant	Reporter	Kamayut Media
20	U Soe Ye Aung	Camera man	MITV
21	U Phyoe Wai	-	Eleven Media
22	U Ye Khaung Nyunt	Reporter	-

② Afternoon Session

Government Department

No.	Name	Desigination	Department
1	U Htun Htun Taung	Head	YCDC,PCCD
2	U Than Win Aung	Engineer	YCDC.PCCD
3	U Aye Lwin	Administor	
4	U Myint Lwin	Administor	
5	U Aung Thu	GAD	
6	U Soe Naing	GAD	
7	U Min Zaw	Deputy Township Administrator	
8	U Win Oo	BC	
9	U Myo Lwin	Township Administrator	
10	Dr Zarni Htay	Township Health Officer	
11	U Thin Taung	DTEO	
12	U Than Zaw Win		
13	Dr Than Than Twe		Thilawa SEZ MC
14	Daw Mya Myat Che		TSEZ.OSSC,Industry
15	Daw Pan Ei Phyu		TSEZ.OSSC,Industry
16	U Bwe Kyone		YCDC,PCCD

Private Company

No.	Name	Designation	Company
1	U Than Htun	Surveryor	ShweMyaing Yadanar

2	U Win San Lin	GM	ShweMyaing Yadanar
3	Daw Ei Ei Khaing	Officer	MJTD
4	Ma Nguwa Hlaing	Assistant Officer	MJTD
5	U Myint Ko	Supervisior	Suntac

No.	Name	Address	Occupation
1	Mg Myat	A lwan Sweet	Farmer
2	Thein Linn Aung	A lwan Sweet	Farmer
3	Win Htay	A lwan Sweet	Farmer
4	U Moe Yar Thi	Shwe Pyaut	Farmer
5	U Myint Hlaing	Moe Kyoe Swan	Security
6	Daw San San Win	Moe Kyoe Swan	Seller
7	U Than Lwin	Aye Mya Thidar	Farmer
8	U Ohm Myint	Aye Mya Thidar	Farmer
9	U Myat Aung	Shwe Pyaut	Farmer
10	U Thin Hlaing	ShwePyi Thar Yar	Hundred Household Head
11	U Kan Kaung	Nyaung Wine	Hundred Household Head
12	U Mg Kyin	Shwe Pyaut	Casual
13	U Aung Kyaing	Shwe Pyaut	Agricultural
14	U Win Hlaing		Farmer
15	DawThein Thein Yi	Kyaut Than	Dependance
16	U Myint Thu	Aye Mya Thidar	Administrator
17	Daw Khin Soe Mar	Thidar Myaing	Seller
18	U San Myint	Shwe Pyaut	Farmer
19	U Khin Aung Myint	Shwe Pyaut	Farmer
20	U Aye Lwin	ShwePyi Thar Yar	
21	U Min Zaw	Nyaung Wine	Administrator
22	Aung Soe	Nyaung Wine	Administrator
23	Daw Yim Nu	Moe Kyoe Swan	Seller
24	Daw San Yi	Moe Kyoe Swan	Seller
25	U Min Naung	Moe Kyoe Swan	Mason worker
26	U Nyein Maung	Moe Kyoe Swan	Carry
27	Nay Myo Aung	Moe Kyoe Swan	Staff
28	U Win Khaing	Moe Kyoe Swan	Seller

29	U Swar Lwin	Moe Kyoe Swan	Seller
30	Daw Khin Khin Theim	Moe Kyoe Swan	Seller
31	U Wae Zin Oo	Moe Kyoe Swan	Labour
32	Daw Zarni	Moe Kyoe Swan	Seller
33	Daw NweYim Win	Moe Kyoe Swan	Seller
34	Daw Htay Win	Moe Kyoe Swan	Seller
35	Ko Myo Min Oo	Shwe Pyaut	Garderning
36	Ko Aung Zaw Moe	A lwan Sweet	Construction
37	U Win Maung	Myaing(2) Nyaung Wine	Seller
38	U Kyaw Moe	Thidar Myaing	Farmer
39	Than Zaw Oo	Shwe Pyaut	Agricultural
40	U Myint Swe	ShwePyi Thar Yar	Hundred Household Head
41	U Thin Latt Ko	Shwe Pyaut	Administrator
42	U Than Win	Shwe Pyaut	Hundred Household Head
43	U Thint Swe	Shwe Pyaut	Hundred Household Head
44	Daw Mar Yi Ma	Shwe Pyaut	Seller
45	U Zaw Myo Than	Moe Kyoe Swan	Seller

NGO

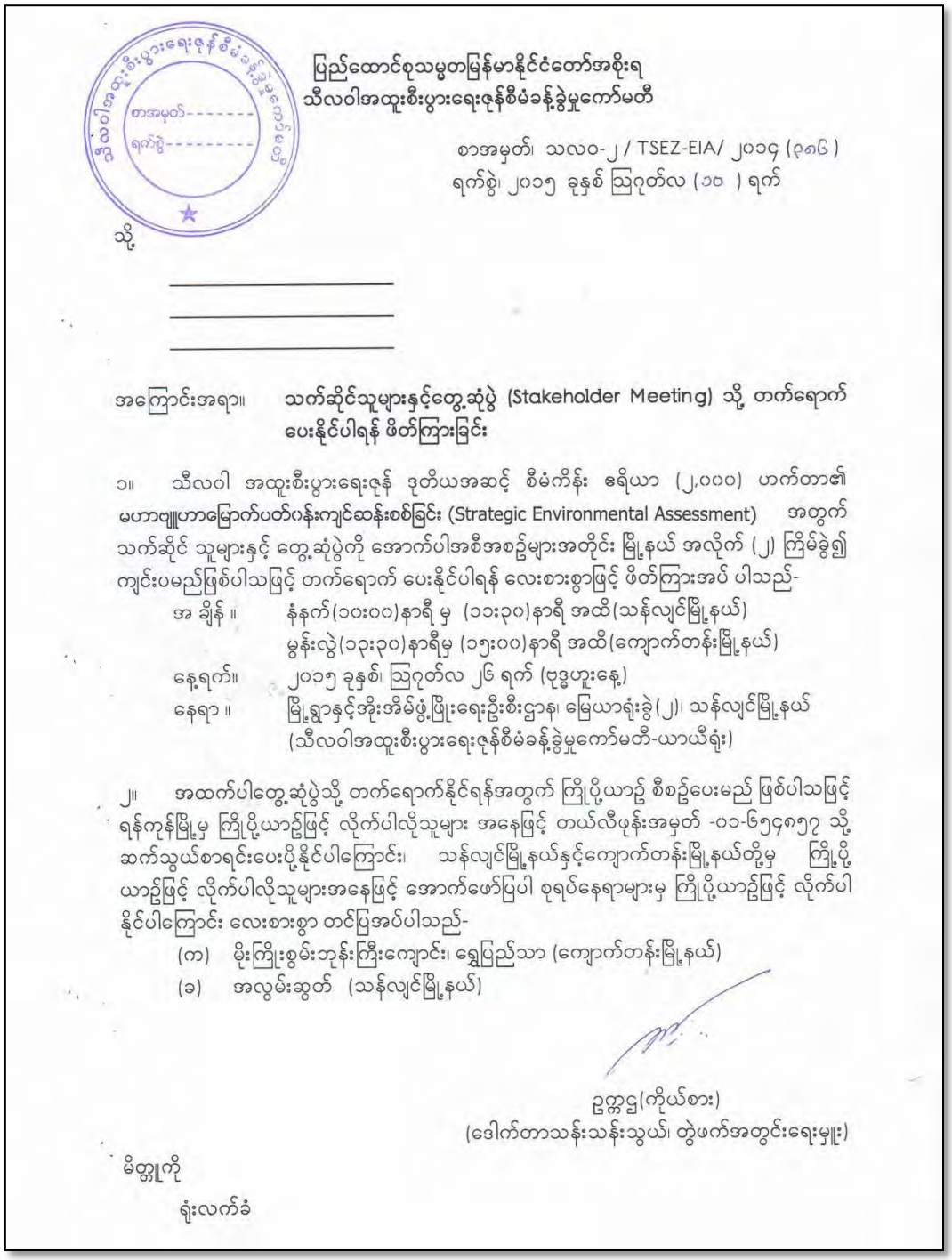
No.	Name	Organization
1	Aung Lwin	JICA Study Team

Media

No.	Name	Designation	Department
1	U Than Win Htun	Chairman	Myanmar Newspaper-Men's Association
2	U Win Soe	Writer	Myanmar Newspaper-Men's Association
3	U Zaw Oo	Writer	Myanmar Newspaper-Men's Association

4. Public Announcement

③ Invitation Letter of TSEZMC (in Myanmar) issued on 10th August, 2015



ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော်အစိုးရ
သီလဝါအထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ

စာအမှတ်၊ သလဝ-၂ / TSEZ-EIA/ ၂၀၁၄ (၃၈၆)
ရက်စွဲ၊ ၂၀၁၅ ခုနှစ် ဩဂုတ်လ (၁၀) ရက်

သို့

အကြောင်းအရာ။ သက်ဆိုင်သူများနှင့်တွေ့ဆုံပွဲ (Stakeholder Meeting) သို့ တက်ရောက်ပေးနိုင်ပါရန် ဖိတ်ကြားခြင်း

၁။ သီလဝါ အထူးစီးပွားရေးဇုန် ဒုတိယအဆင့် စီမံကိန်း ဧရိယာ (၂,၀၀၀) ဟက်တာ၏ မဟာဗျူဟာမြောက်ပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (Strategic Environmental Assessment) အတွက် သက်ဆိုင် သူများနှင့် တွေ့ဆုံပွဲကို အောက်ပါအစီအစဉ်များအတိုင်း မြို့နယ် အလိုက် (၂) ကြိမ်ခွဲ၍ ကျင်းပမည်ဖြစ်ပါသဖြင့် တက်ရောက် ပေးနိုင်ပါရန် လေးစားစွာဖြင့် ဖိတ်ကြားအပ် ပါသည်-

အ ချိန် ။ နံနက်(၁၀း၀၀)နာရီ မှ (၁၁း၃၀)နာရီ အထိ(သန်လျင်မြို့နယ်)
မွန်းလွဲ(၁၃း၃၀)နာရီမှ (၁၅း၀၀)နာရီ အထိ(ကျောက်တန်းမြို့နယ်)

နေ့ရက်။ ၂၀၁၅ ခုနှစ်၊ ဩဂုတ်လ ၂၆ ရက် (ဗုဒ္ဓဟူးနေ့)

နေရာ ။ မြို့ရွာနှင့်အိုးအိမ်ဖွံ့ဖြိုးရေးဦးစီးဌာန၊ မြေယာရုံးခွဲ(၂)၊ သန်လျင်မြို့နယ် (သီလဝါအထူးစီးပွားရေးဇုန်စီမံခန့်ခွဲမှုကော်မတီ-ယာယီရုံး)

၂။ အထက်ပါတွေ့ဆုံပွဲသို့ တက်ရောက်နိုင်ရန်အတွက် ကြိုပို့ယာဉ် စီစဉ်ပေးမည် ဖြစ်ပါသဖြင့် ရန်ကုန်မြို့မှ ကြိုပို့ယာဉ်ဖြင့် လိုက်ပါလိုသူများ အနေဖြင့် တယ်လီဖုန်းအမှတ် -၀၁-၆၅၄၈၅၇ သို့ ဆက်သွယ်စာရင်းပေးပို့နိုင်ပါကြောင်း၊ သန်လျင်မြို့နယ်နှင့်ကျောက်တန်းမြို့နယ်တို့မှ ကြိုပို့ယာဉ်ဖြင့် လိုက်ပါလိုသူများအနေဖြင့် အောက်ဖော်ပြပါ စုရပ်နေရာများမှ ကြိုပို့ယာဉ်ဖြင့် လိုက်ပါနိုင်ပါကြောင်း လေးစားစွာ တင်ပြအပ်ပါသည်-

(က) မိုးကြိုးစွမ်းဘုန်းကြီးကျောင်း၊ ရွှေပြည်သာ (ကျောက်တန်းမြို့နယ်)
(ခ) အလွမ်းဆွတ် (သန်လျင်မြို့နယ်)

ဥက္ကဋ္ဌ(ကိုယ်စား)
(ဒေါက်တာသန်းသန်းသွယ်၊ တွဲဖက်အတွင်းရေးမှူး)

မိတ္တူကို
ရုံးလက်ခံ

④ **Translation of Invitation Letter of TSEZMC**

GOVERNMENT OF REPUBLIC OF THE UNION OF MYANMAR

THILAWA SPECIAL ECONOMIC ZONE MANAGEMENT COMMITTEE

Reference No: Tha La Wa-2/TSEZ-EIA/2015 (386)

Date: 10th August, 2015

To

Subject: Invitation to attend the stakeholder meeting

The stakeholder meeting for Strategic Environmental Assessment-SEA of Thilawa SEZ Development Project Phase II (2000 ha) will be held as follow and YOU are cordially invited to attend this meeting.

Time: 10:00 am – 11:30 am (Thanlyin Township)
13:30 pm – 15:00 pm (Kyauktan Township)

Date: August 26, 2015 (Wednesday)

Venue: Temporary Office of Thilawa SEZ Management Committee,
Branch Office of Land Use (2), Human Settlement and Housing Department. Thanlyin Township.

The transportation will be arranged for all attendees and any interested people from Yangon have to contact with Telephone No. 01 654857 for your confirmation to attend this meeting. The assembly area of the transportation for the people from Thanlyin and Kyauktan townships are as follow:

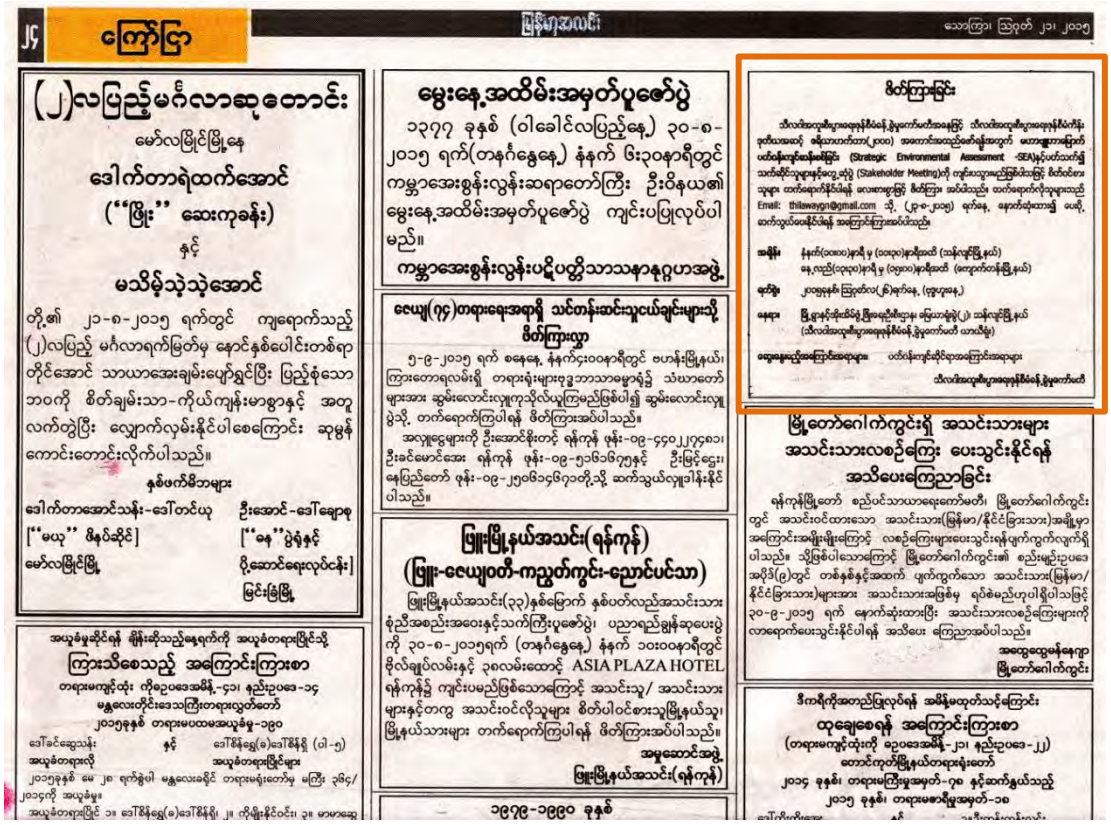
1. Moe Kyo Swam Monastery, Shwe Pyi Thar (Kyauktan township)
2. Ah Lwan Hsut (Thanlyin township)

Sincerely,

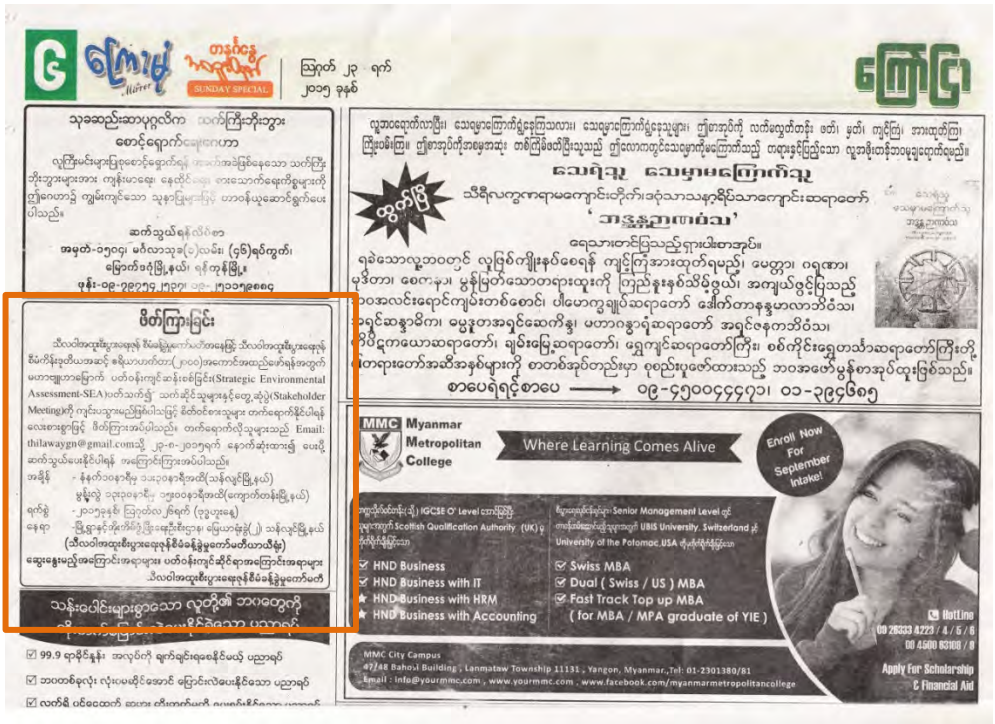
For Chairman

(Dr. Than Than Thwe, Joint Secretary)

⑤ Notification in Myanmar Alin Newspaper on 21st August 2015



⑥ Notification in Mirror (KyeMon) Newspaper on 23rd August 2015



⑦ Translation of Notification

INVITATION

We, Thilawa Special Economic Zone Management Committee, would like to cordially invite you to the Stakeholders' Meeting for the **Strategic Environmental Assessment-SEA** of Thilawa SEZ Phase II Project (2000 Ha). The meeting will be held according to the following plan:

Time: 10:00 am – 11:30 am (Thanlyin Township)

13:30 pm – 15:00 pm (Kyauktan Township)

Date: August 26, 2015 (Wednesday)

Venue: Temporary Office of Thilawa SEZ Management Committee, Branch Office of Land Use (2), Human

Comments and Answers on Strategic Environmental Assessment (SEA)
for Thilawa SEZ Development Project (2,000 ha)

February 2016
Thilawa SEZ Management Committee

No	Reference	Factual points	Comments	Answer by TSEZMC
1	General		I request for the best management by TSEZMC to achieve no negative impacts on environment and people living in special zone area.	Thank you for the information. TSEZMC will manage the SEZ taking into consideration your comment.
2	General		The public don't understand the environmental risks, however they know that those risks must be taken care of for their generation as one of the national tasks.	Thank you for the information. TSEZMC will manage the SEZ taking into consideration your comment.
3	General		For the environmental conservation, all pollutions need to be controlled by the factories in TSEZ.	TSEZMC obliges companies in the SEZ to submit ECPP, and the companies have responsibility of carrying out environmental conservation plan according to the ECPP.
4	General		The SEA states that it will a) provide baseline data; b) identify and analyze anticipated problems; and c) set environmental objectives and standards. We understand that SEAs are also supposed to identify and analyze cumulative impacts of a project. This SEA does not contain this analysis. In addition, we find that the objectives identified by this very SEA have not been met.	This SEA cannot include further analysis/information as the Master Plan-leveled study has not been conducted as of drafting the SEA report. Therefore this SEA merely deals with alternative analysis based on a conceptual land use plan, and does not meet the general level of 'SEA' in terms of its depth of analysis and quantity of information. However, based on your comments, we

			a. The baseline data is very cursory. b. Anticipated problems are neither identified nor analyzed. While the SEA provides an overview of current conditions, it does not indicate how we can expect those conditions to change with the implementation of Phase 2. It would be appropriate at this stage to identify several predictable scenarios and examine the environmental and social impacts such scenarios would have. c. While there is information regarding the various laws, regulations, and guidelines, we did not see any environmental objectives set. In addition, there was mention of standards being applied on a "rolling basis." This opens up the potential for arbitrary changing of applied standards, which could have detrimental environmental and/or social impacts.	will update the baseline data. As for your comment c., the SEA suggests that the appropriate environmental standards should be applied in the EIAs which are to be prepared for each area within the SEZ, and that environmental management plan should be prepared based on the standards.. The SEZ has 5 environmental objectives: Economically Driven, Safe and Secure Livelihoods, Environmentally Friendly, Efficient Infrastructure, and Eco-Smart, as indicated in the SEA.
5	General		There were many issues raised and addressed with varying degrees of success in the Phase 1 area of the Thilawa SEZ, and some are still on-going. There are many lessons from Phase 1 that can be applied to Phase 2, in particular in regard to social impacts, but none of these are mentioned in the SEA.	This SEA cannot include further analysis/information as the Master Plan-leveled study has not been conducted as of drafting the SEA report. Therefore this SEA merely deals with alternative analysis based on a conceptual land use plan, and does not meet the general level of 'SEA' in terms of its depth of analysis and quantity of information. Lessons from Phase 1 regarding social issues shall be dealt with in the
6	General		We find the current quality of the SEA to be insufficient. It fails to address the topics that it itself identifies as the	

			objectives of the study. Further analysis will is needed to identify the types of environmental and social impacts that can be expected. Local people who are supposed to be relocated and who have been carefully monitoring the Phase 1 resettlement process probably have many things to input regarding potential impacts to their livelihoods. More consultations with them could also improve the quality of this SEA.	Resettlement Working Plan Framework for the SEZ and Resettlement Working Plans for each phase.
7	Cover or internal pages		Suggest mention of the SEA authors i.e. E-Guard/ERM	The names of consultants are required in the SEA.
8	Para 1.3, page 1-1	The EIA Rules are not draft – they were adopted August 2014;	This may be intended to be a reference to the draft EIA Procedures (which latest intelligence says the Attorney-General's Office are considering calling Orders)	This has been amended based on your comment.
9	Para 1.3, page 1-2		When and how will the guidelines and standards be determined by the Central Working Committee?	We deleted this sentence as it is not available to obtain such information so far although we have been making inquiries about this matter to the Committee since the SEZ Law was in effective.
10	Para 1.3, page 1-2	Para 1.5 would be expected to include a more up to date account of current tenants and expected employment.	The rationale for conducting an SEA is noted in the document – because the SEZ is 'a regional level programme'. Yet the actual SEA does not consider fully consider the region (see comments in letter above) Similarly page 1-3 the Zone SEZ is touted as a 'leading model city' yet the SEA does not reflect this aspiration (e.g. consideration of energy, water, transport, education and other services)	This SEA is a policy level document that does address regional issues focusing on alternative analysis.

11	Para 2.1		Although the SEA says it will consider 'the socio-environmental aspects of area in and around Thilawa SEZ' it appears to be defining direct impact only as areas within the fence, and not, for example host communities or wide Thanlyin/Kyauktan	This SEA mainly focuses on alternative analysis and not on impact analysis and mitigation measures.
12	Para 2.1/2.2, Part 3 chapeau (p3-1)		There is inconsistent use throughout the report of 'social', 'environmental' and 'socio-environmental'; and the report appears to be put more importance on environmental impacts than social ones. I realise this is partly a confusion arising from definitions in the ECL and EIA procedures, but it would be good for the report to mention both aspects consistently	In the land use planning, both environmental and social aspects are taken into consideration such as avoidance of cultural assets and preservation of lake in the center of the SEZ. Framework for Resettlement Work Plan (RWP) and RWP will examine in detail the social impacts due to resettlement.
13	Page 3-1		EC Rules were adopted Aug 2014 not 2013. Most of the paragraph under Environmental Conservation Rules refers to Article 16 of the ECL and would be better under that heading. It is also unclear why Class A is mentioned, as this is not mentioned in the ECLL Article 16	This has been amended based on your comment.
14	Page 3-1		The Draft EIA Guidelines should be referred to consistently and not called Instructions. The SEZ Law is mentioned as 2013 in the Title and 2014 in the paragraph	This has been amended based on your comment.
15		VFV Law or Rules - It is not clear whether the reference is to the 2012 Law (paragraph refers		This has been amended based on your comment.

		to Law) or the Rules (subtitle).		
16	Page 3-6		Why have WB E&S Safeguards Policies been references but not IFC ones, when the SEZMC and MOECAF are both using IFC standards (see for example the reference on page 4-1)?	The World Bank Guidelines are referenced as the JICA Guidelines refer to it.
17	Para 3.11	EIA Guidelines not Instructions		This has been amended based on your comment.
18	Page 3-8, Table 3-1		This table overall seems weak, particularly the column about implementing best practice. See also comment above about IFC which would be more appropriate for the gap analysis, and as a separate column to the JICA ones	The major gaps are presented here and to be examined for each development project if necessary.
19	Table 4-1, Figure 4.2, Table 4.2		Where were the air quality monitoring points mentioned in the table? There should be a map. Were any outside of the Zone? Why was no water monitoring done outside the Zone?	Please find the air quality monitoring points in Figure 4-1. One of the monitoring points (AQM-3) is outside the SEZ. Water monitoring points are at the border of each stream, which represent the water quality downstream the creeks..
20	Page 4.3		It is good to see a mention of other projects as being contributors to air-shed quality but more detail of which plants are currently in existence or planned, and potential cumulative impacts should be included in this SEA and in the subsequent EIA	The project will go step by step and TSEZMC will manage environmental and social issues as per the SEZ law and other relevant laws and regulations. Cumulative impacts would be addressed by each development project step by step.
21	Page 4-3	Suggest consistent spelling of Bnbwegone Pond and Bant		This has been amended based on your comment.

		Bwaykone Reservoir		
22	Page 4-12 and 4-13		The EIA for Dowa's waste management facility, referenced on p4-13, appears neither to have been the subject to public consultation or disclosure	Stakeholder Meetings were conducted for the project.
23	Page 4-14		Solid waste management for the surrounding communities also needs to be considered.	TSEZMC will coordinate with GADs for various issues which would include waste management.
24	Page 4-23		Given the impacts on the surrounding area and host communities, more information should be gathered on the population various populations close to the Zone.	Information about Population has been included.
25	Page 4-23 = section 4.1.3.(4)		This section concerned baselines so the mention of NGOs willing to work in the area is not relevant. What is the baseline prevalence of HIV/AIDS and other communicable diseases in the area; will this be covered in the EIA?	Information about HIV/AIDS and other communicable diseases has been included.
26	Section 4.1.3		There is no mention in this section of the baseline for other social issues which might be impacted by the Zone and inward migration, such as availability of education and health services, security, inflationary effects. Nor are plans for worker housing mentioned. See MCRB Factsheets on inward Migration, Worker Housing and others in EN/Mya http://www.myanmar-responsiblebusiness.org/fact-sheets/ There is no analysis of the public	Thank you for the information. TSEZMC will manage the SEZ taking into consideration your comment.

			transport baseline	
27	Figure 4-8		It is not clear from this map where the populations living near the Zone are located. Is that the pink colour.	We have provided some descriptions about it.
28	Section 5.1		The 'without project' section is hardly an impartial consideration of other options since the second paragraph of the 'Without Project' case says that the SEZ is the best option; and later that 'the SEZ is therefore the most environmentally and economically sound method for meeting industrial growth in the Yangon region'. However other options could be smaller industrial zones (as elsewhere in Yangon Region	If many smaller industrial zones are randomly located, it would be more difficult to manage and control environmental and social issues in an effective and efficient manner.
29	Page 5-1		This section talks of 'an abundant labour force in Myanmar's most populated area' but there is no analysis anywhere in the document about worker housing or commuting impacts; or transport	This SEA focuses on alternative analysis.
30	Page 5-4	First 2 lines: 'The 2,000 ha Zone that is proposed in this project': as elsewhere in the document, the wording used makes it unclear whether this document is an SEA for the full Zone, or just the 2,000 ha		This SEA is for 2,000ha.
31	Page 6-5		'Impacts on the Poor' (and other aspects in this table) should make clear that host communities are also to be surveyed. See also comments above about consideration of impacts of inward migration. 'Social	This has been amended based on your comment.

			infrastructure' should include education and health	
32	Page 6-6		Children's Rights: It is not clear how Reviewing Myanmar Law Implementation is an effect way to consider impacts on children which could come from education availability, impacts on livelihoods, inward migration, sexual exploitation, increased road traffic, children's increased sensitivity to pollutants etc. The EIA should engage with UNICEF and other experts	This has been amended based on your comment: Review of Myanmar law implementation, data and info by UNICEF and other experts.
33			How are **cumulative impacts** going to be addressed in the EIA (e.g. cumulative impacts of non-SEZ projects in the area such as the Port and industrial projects)?	The whole project will go step by step and TSEZMC will manage environmental and social issues as per the SEZ law and other relevant laws and regulations. Cumulative impacts would be addressed by each development project step by step.
34	Table 7-2	It is not apparent from either documentation from the President's Office or the Thilawa SEZ website that 'SEZ Law exempts individual factories from undertaking an EIA process'. Our understanding is that any project which would need to undertake one outside the Zone needs to undertake one inside. This should be clarified so as to avoid confusion.		TSEZMC decides based on ECPP (Environmental Conservation and Prevention Plan) whether certain factory needs IEE or EIA. In Class A, some factories were required to conduct EIA as a result of the above mentioned process.

			Table 7-3 does not appear to address many of the stakeholder comments in Table 7-2, or even all of those made in the June 2014 meeting.	We combined some comments of the same issues, which might make you think that all the comments are not included. Please check the minutes of the stakeholder meeting.
35	Table 8-1		Shouldn't 'safe and secure livelihoods' be an objective beyond companies and communities in the SEZ, i.e. also 'around'	This is a development objective within the responsibility of TSEZMC established before, which will also contribute to the local communities. TSEZMC will coordinate with GAD for local community.
36	Section 8.3		Is the intention that there should be one EMP for the Zone, or two?	EMP is supposed to be prepared for each project.
37	Section 8.4	Presumably, notwithstanding the wider confusion this paragraph raises (see letter), it is anyway not intended that 'the SEZ managing body should conduct some sort of EIA procedures'		The project will go step by step and TSEZMC will manage environmental and social issues as per the SEZ law and other relevant laws and regulations.
38	Figure 8-1		The chart giving 'Responsibility of Environmental Management' to MJTD is of significant concerns given MJTD's lack of expertise and potential conflict of interest. It is also a matter of concern that there is nothing envisaged for independent or community involvement in monitoring (a point raised repeatedly in Table 7.2). Nor is there any provision in this diagram for	The Figure 8-1: Implementation and Monitoring of Environmental Management Plan has been replaced by a new chart based on the latest situation of the operation.

			transparency and publication of data,	
39	Para 8.5		It would be preferable for an Operational Grievance Mechanism to be established both for the Zone and for individual companies which meets the criteria in the UN Guiding Principles on Business and Human Rights and has been designed by the community in cooperation with the Project Proponent, Developer and Tenant companies. This is not currently in place up for Class A. This issue is being discussed within the Multistakeholder Advisory Group	Grievance Redress mechanism is being prepared by TSEZMC to respond to complaints from local communities. The SEA report has been updated.
40	Other		It would be good to mention about Notice No.4 on Human Rights issued by TSEZMC in August.	This has been added based on your comment.

Appendix D: Baseline Data (Detailed)

Table of Contents

Figures

Tables

1 Description of the Surrounding Environment

This baseline scoping section will set out the baseline socio-environmental conditions, identify possible environmental issues/impacts related to changes in land use and Project implementation, review domestic Myanmar rules and regulations, and review the international guidelines that are applied to this project. In order to gauge the magnitude of impacts, studies were developed as described in the table below.

Table 1 Investigation of Environmental Impact Assessment

Category	Item	Survey Item	Survey Method	Quantity
Pollution Control	Air Quality	Local pollutant indicators: NO_2/NO_x, SO_2, CO, SPM, PM10	Air quality measurement by instrument	6 locations, 2 days/time, 2 times per year (both rainy and dry season)
	Water Quality	Surface water: Temperature*, flow rate*, odor*, color*, electrical conductivity*, pH*, BOD5*, SS*, DO*, total coliform, COD, total nitrogen, total phosphorous, oil and grease, turbidity, arsenic (As), mercury (Hg), lead (Pb), cadmium (Cd), hexavalent chromium (Cr(VI)), copper (Cu), zinc (Zn), nickel (Ni), iron (Fe), cyanide (CN) Underground water: Temperature*, odor*, color*, electrical conductivity*, hardness, pH*, arsenic (As), mercury (Hg), led (Pb), cadmium (Cd), hexavalent chromium (Cr(VI)), copper (Cu), zinc (Zn), nickel (Ni), iron (Fe), cyanide (CN), oil and grease, fluoride, nitrates (NO_3-N, NO_2-N), ammonium nitrogen (NH_4-N), total coliform, water level*	Sampling and measurement by field equipment and laboratory analysis	Surface water: 6 locations, 2 times (both rainy season and dry season). Asterisked items are measured monthly at the 6 locations. Underground water: 3 locations, 2 times (both rainy season and dry season). Asterisked items are measured monthly at the 3 locations.
	Wastewater	Industrial wastewater practices in Myanmar	Interviews with other industrial parks and with relevant authorities	Depends on discharge points of wastewater
	Waste	Amounts of construction waste, amount of operational (industrial/household) waste, location/method for final disposal, capacity for final disposal, responsible authority for waste disposal	Interviews with relevant authorities, reference to construction planning data.	N/A
	Soil Contamination	Mercury (Hg), arsenic (As), lead (Pb), cadmium (Cd), copper (Cu), zinc (Zn), hexavalent chromium (Cr(VI))	Sampling and measurement by laboratory analysis	1 time, 2 locations
	Noise &Vibration	Traffic volume, noise level	Vehicle survey and noise survey	Vehicle survey: 2 intersections and 2 road sections Noise survey: 24 hr continuous monitoring in 6 locations @15-20 seconds/record
	Land Subsidence	Construction water demand	Interviews with relevant authorities Possible water sources in and around the project site.	N/A
	Offensive Odor	Identification of potential sources and receptors in and around the	Examination of possible odor sources and	N/A

Category	Item	Survey Item	Survey Method	Quantity
		site (residences, social infrastructure, etc.)	vectors through the interviews	
	Sediment	Engineering and construction plans for 2,000 ha site.	Literature review	N/A
Natural Environment	Protected Area	Nationally and internationally important areas in terms of flora, fauna, cultural heritage, etc.	Identification of protected areas in and around the site	N/A
	Ecosystem	Water and land ecosystems on the site	Flora/Fauna (mammal, bird, reptile, fish, amphibian, plants/tress) survey, site walk, identification of sensitive habitats in and around site	Flora and Fauna survey conducted once during dry season and once during rainy season
	Hydrology	Surface and underground hydrology	Confirmation of Land Use Plan	N/A
	Topography and Geology	Elevation and geology in and around site	Literature review	N/A
Social Environment	Involuntary Resettlement	Location and number of people in existing households within the 2,000 ha area that are to be moved	No information was available. (Resettlement Work Plan (RWP) is being prepared separately)	N/A
	Impacts on the Poor	Status of the living situation of the poor as well as integration opportunities with the new SEZ	Review of social statistics applicable to the area, reference to RWP-related documentation, interviews with local persons, host communities will be surveyed for consideration of impacts of inward migration	N/A
	Ethnic Minorities and Indigenous Peoples	Status of ethnic minorities and indigenous persons in the site	Review of social statistics applicable to the area, interviews with local persons	N/A
	Living and Livelihood	Status of major livelihoods in the area	Review of social statistics applicable to the area, interviews with local persons	N/A
	Land use and use of local resources	Status of current and future land use including availability and access to resources such as land, roads, aquatic, and water	Examination of land use plans, evaluation of current local resource use through interviews with local persons, reference to the RWP	N/A
	Water availability	The sustainability of and access to water resources	Literature review	N/A
	Existing social infrastructure and services	Identification of social infrastructure including community centers, education, health and religious facilities	Field survey and information available from project resources	N/A
	Uneven distribution of benefits and damages	Socio-economic status of local people and potential changes as a result of the project	Field survey interviews with local persons	N/A
	Conflict of interest in the area	General investigation of potential conflicts of interest in project operation and implementation	N/A	N/A
	Cultural Heritage	Identification of cultural heritage in and around the site	Field survey, interviews with government officials, reference to historical documents	Conducting 1 field survey to verify findings in documentation.
	Landscape	Identification of landscape impacts	Field survey	N/A
	Gender	Identification of impacts on gender equality	Review of gender statistics by industry	N/A

Category	Item	Survey Item	Survey Method	Quantity
	Children's Rights	Identification of child vulnerabilities as a result of this project	Review of Myanmar law implementation, data and info by UNICEF and other experts	N/A
	Infectious Disease such as HIV/AIDS	Identification of prevalence and potential spread of infectious disease as a result of project construction and operation	Review of infectious disease statistics and HIV/AIDs related activities in the area during construction and plans after operations commence.	N/A
	Working conditions (including occupational safety)	Issues surrounding working conditions including non-compliance with international and national conventions and laws and occupational safety	Review of laws and regulations applicable to the project	N/A
	Accidents	Probability of increased accidents on site	Confirmation of engineering plans for pedestrian and motorways	N/A
	Transboundary impacts or Climate Change	Identification of possible sources of GHGs as a result of project implementation		N/A

1.1 General Site Setting

Myanmar is the largest country in Southeast Asia with a total land area of 676,578 km^2. It is bound on the north by the People's Republic of China, on the east by the Lao People's Democratic Republic and the Kingdom of Thailand, and on the west by the People's Republic of Bangladesh and the Republic of India. The southern border is facing the sea. The main river system, the Irrawaddy River, flows from north to south before fanning out into the multi-fingered Irrawaddy Delta in the south of the country eventually emptying into the Andaman Sea and the contiguous Bay of Bengal. East of the Irrawaddy River Basin and across the Pegu range, lies the Sittaung River Basin—distinct but not disconnected from the Irrawaddy River Basin—also flowing from north to south before emptying its contents into the Gulf of Martaban. At the confluence of two tributaries of the system, the Yangon River and the Bago River, lays the Yangon Region and the eponymous city of Yangon, the largest city in Myanmar. Roughly 20km from the city center across the Bago River via either the Dagon Bridge or the Thanlyin Bridge, are situated the townships of Thanlyin and Kyauktan lying respectively north to south along the eastern bank of the Yangon River. This area is also collectively known as Syriam and is host to the Thilawa SEZ.

Myanmar is a country of great diversity in terms of topography, geology, meteorology, agro-ecological zones, cropping patterns, ethnicity, natural resources, and the livelihood patterns of the total population of 55.746 million persons (estimated July 2014) with a moderate population density of about 82 people per km^2. The country can be characterized as a primarily young, rural country. The urban/rural ratio in Myanmar is about 30:70. About 26.4 percent of the population is between 1 and 14 years old (male 7,498,179/female 7,209,588), and 5.2 percent (male 1,277,919/female 1,659,588) is 65 years old and above.

Myanmar is constituted of seven Regions, seven States and the Union territories. States and Regions of Myanmar are divided into districts. These districts consist of townships that include towns, ward and village-tracts. Village-tracts are groups of adjacent villages and the lowest administrative division.

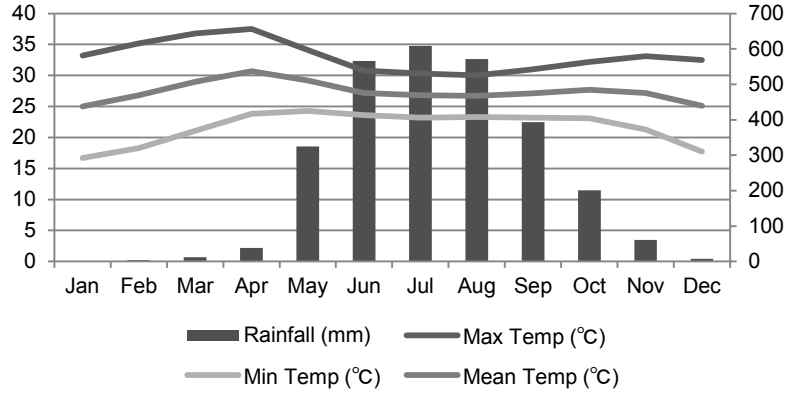
The Syriam area is characteristic of rural lower Myanmar and has been an agricultural hinterland of the economic confluence of Yangon for centuries. The land is flat and dominated by the riverine influence of the Sittaung Delta and the yearly toing and froing of the tropical monsoon climate of the Bay of Bengal. Like other tropical monsoon environments in neighboring countries, the weather is hot and humid during the monsoon months from June to October, but the area also experiences a relatively cold season from November to February and a hot and dry season from March to May. Given the proximity to the marine environment and the concomitant stabilizing effects on the local climate, the terms “hot” season and “cold” season are relative. While there is no weather station directly in the area, the Kabaaye weather station in Yangon City (roughly 15km from the center of the Thilawa site) indicates the following temperature and precipitation data.

Table 2 Meteorology Data from Kabaaye Weather Station in Yangon City (1981-2010)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average/ Total
Max Temp (℃)	33.2	35.2	36.8	37.5	34.1	30.8	30.3	30.0	31.0	32.2	33.1	32.5	33.1
Min Temp (℃)	16.7	18.3	21.1	23.8	24.3	23.6	23.2	23.3	23.2	23.1	21.3	17.7	21.6
Mean Temp (℃)	25.0	26.8	29.0	30.7	29.2	27.2	26.8	26.7	27.1	27.7	27.2	25.1	27.4
Rainfall (mm)	1	4	12	38	325	566	608	571	393	201	61	7	2,787

Source: SEZ Management Committee

Figure 1 Meteorology Data from Kabaaye Weather Station in Yangon City (1981-2010)



Source: SEZ Management Committee

1.2 Pollution Control

In Myanmar there are currently no nationally required ambient environmental regulations.

However, there are currently regulations under debate between MOECAF, Ministry of Industry (MOI), Ministry of Science and Technology (MOST) (and MOST's ESQ subcommittee), etc. As an interim measure before the national environmental regulations are implemented, it is proposed that an EIA for a new project will need to specify an Environmental Management Plan (EMP) with the ambient and emissions standards to be conformed to within the SEZ. If and when the national environmental standards are implemented, these national environmental standards will take precedence and form the new standards for the SEZ environmental regulations. To the extent that the national environmental standards are implemented on a subject-basis (water, effluent, air, etc.), the national environmental standards will replace the corresponding environmental subject on a rolling basis. It is noted that other industrial parks (such as Mingladon Industrial Park) in Yangon has air quality standards established based on those used in the neighboring countries for their environmental management objectives.

In the interim before the national environmental standards are implemented, the Government of Myanmar has decided that the IFC Environmental, Health, and Safety (EHS) Guidelines will apply to the SEZ zone. The IFC EHS Guidelines provide the performance levels and measures that are normally acceptable to IFC, and that are generally considered to be achievable in new facilities at reasonable costs by existing technology. The Government of Myanmar has decided on these measures among others due to the fact that they: have good cost/ performance balance; designed for applicability in developing countries; are project-focused/ easy to implement in an SEZ scenario; provide industry sector guidelines for best practice operations; and are generally accepted by all international financial organizations (NEXI, JBIC, ADB, JICA, World Bank, etc.) for financing projects.

For environmental management coordination it is proposed that environmental standards for the entire 2,000ha area will be set in coordination with the Class A area. However, at a minimum the standards set for the 2,000ha area will conform to the IFC standards proposed by the Central Working Body and/or any Myanmar national environmental standards that are enforced.

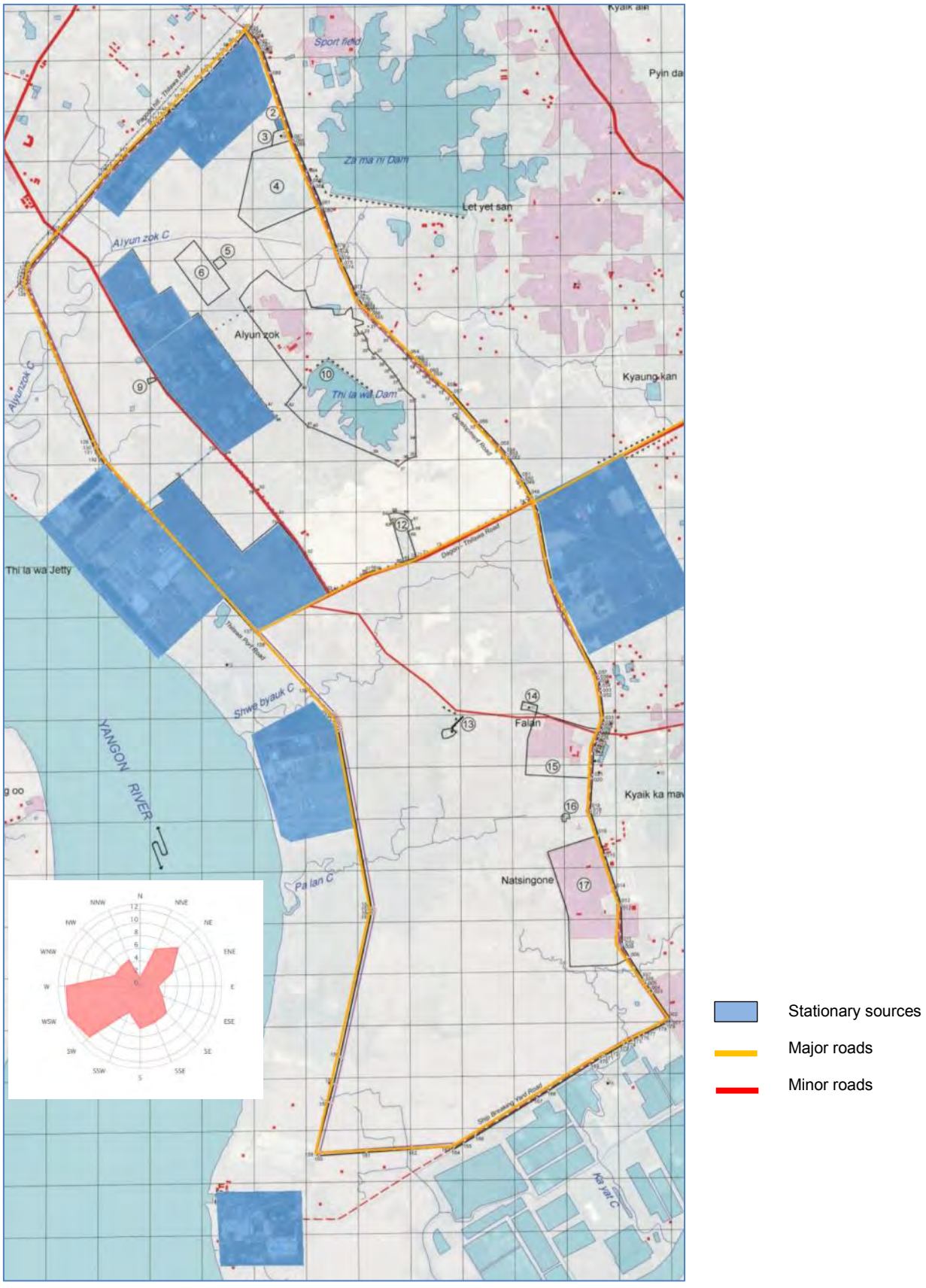
The main pollution sources within an SEZ are point source pollution such as factories and mobile sources such as vehicles, land use change, etc. The SEZ as a whole must manage the pollution of individual factories and the SEZ as an integrated system. Therefore, it was proposed by the Central Working Body to deal with these cumulative impacts in a two-tiered manner implementing zone-wide standards backed up by factory-based ambient and emissions standards. For example, a factory will be required to meet a certain minimum standard for wastewater effluent before discharging that effluent to the SEZ-wide wastewater processing facilities.

The sections following will detail the quantitative targets matching those of the IFC EHS Guidelines as agreed by the Central Working Body for each environmental theme and detail the baseline survey results of the surveys conducted as part of this baseline EIA Framework study.

1.2.1 Air Quality

1） Existing Air Quality

The only existing significant sources of anthropogenic emissions near the site are the factory area in the domestic SEZ on the eastern middle border of the SEZ, the maritime facilities (naval yard, ship breaking, and port facilities) along the western border, and small existing factories within the exclusion zones of the SEZ itself. The educational facilities and surrounding residential areas both in the SEZ and in the greater Kyauktan and Thanlyin areas are not considered a significant source of air emissions. The City of Yangon and its associated air emissions sources are unlikely a large impact in terms air quality within the Thilawa SEZ since the City is both distant at roughly 12km to the north and downwind of the prevailing winds coming West-Southwest from ocean to the South of the SEZ. Existing facilities with potential for significant contribution to air pollution in the SEZ airshed are shown in blue while major road arteries are shown in yellow in the figure below.



Source: SEZ Management Committee

Figure 2 Potentially Significant Baseline Anthropogenic Air Emissions Sources

2） Quantitative Target

The key methods used to manage air quality are to (1) specify concentration limits for pollutants in the ambient air and (2) to specify concentration limits at the point of emission (i.e., in the case of the Thilawa SEZ, mainly in-stack concentration limits at each factory,). Ambient concentrations depend not only on the in-stack concentration, but also on the volume flux of the emission (i.e., the size of the source), the plume rise, the stack height, existing levels of pollution from other sources and the dispersive capacity of the atmosphere. It is the ambient concentrations that are critical for protecting the environment. Emission limits are set to ensure that equipment functions efficiently and that appropriate technology is used, taking account of the environment in which it is operated.

Ambient Air Quality Targets

The air quality guidelines determined for this project by the Central Working Body are to be derived from those recommended by the IFC EHS Guidelines on Air Emissions and Ambient Air Quality. These Guidelines suggests that the prevention of significant impacts should prevent or minimize impacts by ensuring that:

- Emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying national legislated standards, or in their absence, the current WHO Air Quality Guidelines or other internationally recognized standard such as the United States National Ambient Air Quality Standards (NAAQS);

- Emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, it is suggested to set the standards at 25% of the applicable air quality standard to allow additional, future sustainable development in the same airshed.

The suggested ambient air quality standards are set in principle according to ~25% of NAAQS except for particulate parameters and NO2 parameters which are not discounted due to the relatively high baseline levels in the area, as presented in the following table.

Table 3 NAAQS-Derived Interim Ambient Air Quality Standards for Thilawa Airshed

Pollutant	Averaging Time	Level	Form
Carbon Monoxide (CO)	8 hour	3 ppm	Not to be exceeded more than once per year
	1 hour	9 ppm	
Nitrogen Dioxide (NO_2)	Annual	0.053 ppm	Annual mean
	1 hour	0.100 ppm	98th percentile, averaged over 3 years
Particle Pollution (PM10)*	24 hour	150 $\mu g/m^3$	Not be exceeded more than once per year on average over 3 y ears

Pollutant	Averaging Time	Level	Form
Total Suspended particles (TSP) *	24 hour	260 μg/m^3	Not be exceeded more than once per year
Sulfur Dioxide (SO_2)	3 hour	0.13 ppm	Not to be exceeded more than once per year

Note: ppm=parts per million

Source: NAAQS; http://epa.gov/air/criteria.html

Point Source Emissions Targets

Point sources are discrete and stationary sources of emissions releasing pollutants into the atmosphere. They are located principally in manufacturing or production plants. However, within a given factory, there may be several individual emission points that collectively comprise the single point source emission.

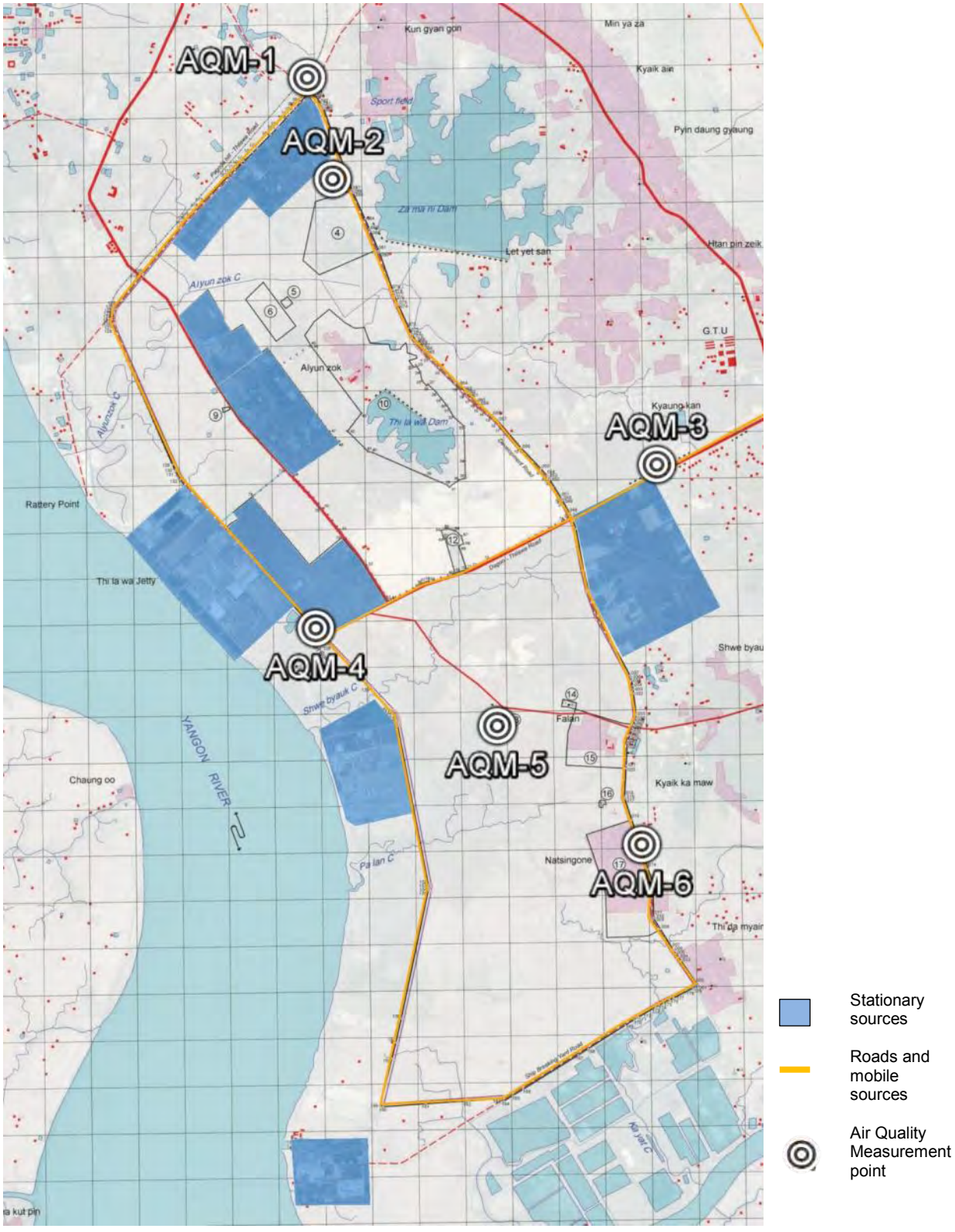
The pollutant types are typically derived from the combustion of fossil fuels and can include nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), and particulate matter (PM). There may also be some point source emissions associated with industrial activities involving volatile organic compounds (VOCs) and metals. To the extent possible, emissions from such sources should be avoided and controlled according to good international industry practice (GIIP) Industry Sector Guidelines applicable to the relevant industry sector, through the combined application of process modifications and emissions controls.[1]

For point source emissions in the Thilawa SEZ within 800m of the SEZ boundary, whether significant or not, should follow GIIP. Point source emissions in the SEZ but beyond the 800m SEZ boundary should follow GIIP only if the point source emission is a combustion facility (any fuel) with heat output between 3MWth and 50 MWth. For point source emissions that are greater than this, a separate application to the SEZ One Stop Service Center should be made.

3） Survey Results

The survey was conducted in both the dry season and the rainy season. 24 hour data was taken twice on consecutive days at 6 different air quality monitoring (AQM) points. The AQM points were chosen to provide a comprehensive evaluation of the general air quality of the area including existing potentially significant air emissions sources and roads. As air quality is affected by moisture in the air and temperature, days for measurement were chosen according to being hot and dry during the dry season and relatively wet during the rainy season. These points are presented in the figure below.

[1] GIIP guidelines by industry can be found at: www.ifc.org/ehsguidelines



Source: SEZ Management Committee

Figure 3 Air Quality Sampling Points

Aeroqual S500 ENV portable handheld meter is used to measure CO, NO2, SO2 gases at 3hrs interval for 48 hrs at the same designated location of PMs measurement. Non PM10

gas measurements were averaged from samples taken at a 1 min intervals averaged over 1 hour for 8 measurements at each air quality monitoring point. A portable gas monitor was used to measure CO, NO2 and SO2. The sensors employed were of an electrochemical sensor type. PM10 and TSP measurements taken with a Grimm's EDM164 dust monitor (EN12341 US-EPA equivalent) and data was logged once per hour at a 5 minute interval for 24 hours over a 48 hour period.

The data collected is indicated in the table below.

Table 4 Ambient Air Quality Survey Results

		Quantitative Target	Rainy Season Average	Dry Season Average
AQM-1	PM10	24 hr ave < 150 µg/m^3	24.1	71
	TSP	24 hr ave < 260 µg/m^3	35.6	145
	CO	1 hr ave < 9 ppm	0.108	0.094
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.059	0.087
AQM-2	PM10	24 hr ave < 150 µg/m^3	11.5	108
	TSP	24 hr ave < 260 µg/m^3	14.8	308
	CO	1 hr ave < 9 ppm	0.017	0.022
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.045	0.068
AQM-3	PM10	24 hr ave < 150 µg/m^3	16.4	81
	TSP	24 hr ave < 260 µg/m^3	29.8	175
	CO	1 hr ave < 9 ppm	0.015	0.367
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.059	0.059
AQM-4	PM10	24 hr ave < 150 µg/m^3	13.9	108
	TSP	24 hr ave < 260 µg/m^3	21.2	237
	CO	1 hr ave < 9 ppm	0.053	0.114
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.057	0.096
AQM-5	PM10	24 hr ave < 150 µg/m^3	9.3	34
	TSP	24 hr ave < 260 µg/m^3	10.8	61
	CO	1 hr ave < 9 ppm	1.426	0.818
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.051	0.038

		Quantitative Target	Rainy Season Average	Dry Season Average
AQM-6	PM10	24 hr ave < 150 µg/m^3	16.1	54
	TSP	24 hr ave < 260 µg/m^3	24.2	97
	CO	1 hr ave < 9 ppm	0.017	ND
	SO_2	3 hr ave < 0.13 ppm	ND	ND
	NO_2	1 hr ave < 0.10 ppm	0.058	0.330

PM10=Particulate Matter; TSP=Total Suspended Particulates; CO=Carbon Monoxide; SO2=Sulfur Dioxide; NO2=Nitrogen Dioxide; ND=Not Detected at lower detection limit.
Notes: Data taken over the period from 29 May 2014 to 06 June 2014 for the rainy season and March 30-April 4, 2015 for the dry season.

Source: SEZ Management Committee

The results indicate that the air quality survey in the Thilawa area is generally good in the rainy season but worsens during the dry season, particularly for particulate parameters. The Ambient Air Quality survey was conducted once for each season, so even through high concentrations of total suspended particulates (TSP) and of nitrogen dioxide (NO_2) was detected, the high concentrations are likely to be short-term.

1.2.2 Water Quality (Surface and Groundwater)

1） Existing water quality

There are two main bodies of water near to the site. The site is proximate (roughly 700m) to the eastern bank of the Yangon River, which flows from north to south, and the northern bank of the Hmawwun River, which flows from east to west and drains into the Yangon River. There are four streams on the site that flow east to west into the Yangon River and two streams that flow north to south into the Hmawwun River. Roughly 21km downstream of the bank closest to the southwestern tip of the 2,000ha area the Yangon River flows into the Gulf of Martaban and the Indian Ocean.

As for water resources directly in the 2,000ha area there are the six main on-site streams with water almost all year round. However some of these streams are inconsistently dammed by local farmers or else may run at an immeasurable flow rate at low tide during the dry season. These are seasonally connected to permanent bodies of water in the SEZ: the Thilawa Reservoir in the north-central area and the Bant Bway Kone Reservoir in the south-central area. There are two additional permanent bodies of water directly to the east of the site: the Zarmani Reservoir to the northeast and the Bant Bwaykone Reservoir to the east. The two northern-most streams exiting from the western border of the 2,000ha zone are connected with these latter two reservoirs and rainwater catchment area. However, there is a sluice gate preventing direct connection of the reservoirs and the streams. Reportedly, the sluice gate for Zarmani Reservoir is not opened on a regular basis. The two

remaining southern streams exiting the western border as well as the two streams exiting the southern border are fed by rainwater catchment on and off the site. All reservoirs in and around the site are in turn fed by rainwater catchment. In the rainy season the water flowing off site is significant with the two northernmost streams at a depth up to 4m and a width of roughly 10m at some places. In both the dry season and the rainy season the streams experience tidal intrusion with brackish water at high tide. However in the dry season the streams are almost exclusively brackish water at high tide while running dry at low tide. The creek of highest concern is that where wastewater will be disposed of from the Project as well as from the Class A zone. The outlet for wastewater for the project is via Shwe Byauk Creek to the Yangon River, to the west of the wastewater outlet.

Residents in the area rely on hand dug and tube wells in the area for drinking water, although purchased bottled water and trucked water is also consumed in significant quantities.

2） Quantitative Target

Discharges of wastewater or stormwater to surface water should not result in contaminant concentrations of ambient water quality guidelines, when they come into effect in the future. According to IFC EHS Guidelines, discharges to surface water should not result in contaminant concentrations in excess of local ambient quality criteria or other sources of ambient water quality. As noted above, Shwe Byauk Creek and the Yangon River at Shwe Byauk Creek's outlet point is the water body of highest concern since processed wastewater will flow into this creek.

Factors to be taken into account when setting the Project specific performance levels for surface water quality include: (i) receiving water use and assimilative capacity; (ii) other sources of discharges to receiving water; (iii) process wastewater and sanitary waste discharge treatment standards consistent with the applicable guidelines; and (iv) temperature of water prior to discharge.

Receiving water is the Shwe Byauk Creek and then the Yangon River. Shwe Byauk Creek has a minimal assimilative capacity in the dry season when it sometimes runs dry. In both the dry and rainy seasons the creek is heavily influenced by tidal variation. Yangon River has a high assimilative capacity.

Other wastewater outlets into the creek are limited to the Class A wastewater treatment facility and the effluent from the Dowa solid waste treatment facility. Further downstream in the Yangon River, there are a number of wastewater outlet points that mainly come from the Yangon City area. Data is not available on the type, amount, and location of effluent outputs from the Yangon City area, but given the relative location of the project are and the Yangon

City area, any contaminants from effluents are likely to be very well dispersed by the time they flow past the Shwe Byauk Creek outlet point. More localized discharges include from north to south: the Navy area, the various dockyards, the shipbreaking yard, and the aquaculture facilities.

National Recommended Water Quality Criteria of EPA is employed for ambient water quality, and WHO's Guideline for Drinking-water Quality is employed to compare samples collected from groundwater.

Table 5 Ambient Water Quality Criteria for Aquatic Life

Parameter	Unit	Threshold Value (Criteria Maximum Concentration)[2]
Total Coliform	cfu/100mL	-
COD	mg/L	-
Total Nitrogen	µg/L	-
Total Phosphorous	µg/L	-
Turbidity	NTU	-
Arsenic (As)	µg/L	340
Mercury (Hg)	µg/L	1.4
Lead (Pb)	µg/L	65
Cadmium (Cd)	µg/L	2.0
Chromium (Cr) (VI)	µg/L	16
Copper (Cu)	µg/L	2.337
Zinc (Zn)	µg/L	120
Nickel (Ni)	µg/L	470
Iron (Fe)	µg/L	-
Cyanide (CN)	µg/L	22

*EPA does not specify specific targets for items, "-".
Source: National Recommended Water Quality Criteria of EPA

Groundwater in the first aquifers is found at a shallow depth (0.7-5.6m bgl) as measured in 3 different wells in use. Therefore the groundwater vulnerability is considered to be high. The groundwater is also used for drinking purposes and is the main source of household water use for a number of villages in the area and the groundwater sensitivity is also considered to be high.

WHO criteria for drinking water as noted in the Draft National Environmental Quality Standards are provided below. However at the present time it is not considered technically feasible to meet these guidelines in Myanmar. Therefore the table below should be considered as guidance rather than standards for implementation in the present project.

Table 6 WHO Guidelines for Drinking Water Quality

Parameter	Unit	Quantitative Target

[2] The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.

Parameter	Unit	Quantitative Target
Total Coliform	**cfu/100mL**	**ND**
Arsenic (As)	**mg/L**	**0.01**
Mercury (Hg)	**mg/L**	**0.006**
Lead (Pb)	**mg/L**	**0.01**
Cadmium (Cd)	**mg/L**	**0.003**
Chromium (Cr)	**mg/L**	**0.05**
Copper (Cu)	**mg/L**	**2**
Zinc (Zn)	**mg/L**	**-**
Nickel (Ni)	**mg/L**	**0.07**
Iron (Fe)	**mg/L**	**-**
Cyanide (CN)	**mg/L**	**-**
Fluoride	**mg/L**	**1.5**
Hardness	**mg/L**	**-**
Nitrates (NO3-N)	**mg/L**	**50**
Nitrites (NO2-N)	**mg/L**	**3**
Ammonium Nitrogen (NH4)	**mg/L**	**-**

*WHO does not specify specific targets for items, "-".
Source: Guidelines for Drinking-water Quality Fourth Edition (WHO)

3） Survey Results

The water quality survey was conducted with a limited parameter set monthly for one year with an additional extended parameter set. Six surface water (SW-1 to SW-6) points and three groundwater (GW-1 to GW-3) were selected as representative samples of surface and groundwater quality in the area.

Source: SEZ Management Committee

Figure 4 Surface and Groundwater Monitoring Points

The results of the monitoring are as below.

Table 7 Surface and Groundwater Sampling Results (Limited Parameter Set)

Parameter	Unit	Sample Date											
		18/12/2013	2014/1/7	2014/1/30	2014/2/18	2014/3/14	2014/4/1	2014/4/25	2014/5/16	2014/6/3	2014/6/24	2014/7/15	2014/8/5
SW-1													
Temp	**°C**	25.3	23.9	24.8	26.2	35.3	31.2	33.4	29.6	31.7	28.4	28.7	27.4
Flow*	**m^3/s**	-	-	-	-	-	-	-	-	-	-	-	-
Level/Depth	**m**	- /0.12	- /0.13	- /0.14	- /0.2	- /0.1	- /0.2	- /0.2	- /0.2	- /0.2	- /1.6	4 /-	3 /-
Odor	**-**	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy	muddy
Color	**TCU**	-	45	130	50	20	10	10	10	40	60	100	50
EC	**µs**	1956	142	223	1735	21.67	23.01	20.61	20.61	659	226.1	82.9	51.4
pH	**-**	7	6.9	7.1	7.1	8.66	7.7	7.32	7.32	6.57	6.38	6.39	6.13
BOD	**mg/L**	3.2	1	2.5	2.5	2	2	2.5	2	2	2.5	2	1.5
SS	**mg/L**	540	1068	1035	1912	110	36	36	36	68	382	172	92
DO	**mg/L**	5.2	4	5	4.5	10.36	4.12	4.12	4.12	46.6	3.08	50.5	39.6
SW-2													
Temp	**°C**	23.6	24.2	24.6	26.4	33.3	30.8	33.9	27.1	31.3	28.2	28	27.4
Flow*	**m^3/s**	0.141	0.129	0.102	0.085	0.083	0.089	0.083	0.083	-	-	-	-
Level/Depth**	**m**	-	-	-	-	-	-	-	-	-	-	-	-
Odor	**-**	muddy	muddy	muddy	muddy	muddy	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	20	80	95	90	25	50	80	80	120	90	160	80
EC	**µs**	1792	411	293	1086	21.47	25.95	22.03	22.03	6.74	325.9	211.1	42.6
pH	**-**	6.8	6.7	7.2	7.1	8.37	7.39	7.98	7.98	7.81	6.73	7.25	6.39
BOD	**mg/L**	0.5	2	2	2	1.5	2	2.5	2	1.5	2	2	1
SS	**mg/L**	526	1052	505	1983	103	95	95	95	388	1320	300	188
DO	**mg/L**	5	4	4.5	4	8.96	4.01	4.01	4.01	3.93	4.23	58	43.2
SW-3													
Temp	**°C**	25.3	24.8	23.8	27.3	34.5	31.8	34.3	29.6	30.2	28.5	27.7	27.1
Flow*	**m^3/s**	-	0.105	0.089	0.068	0.058	0.056	0.051	0.051	-	-	-	-
Level/Depth**	**m**	- /0.12	-	-		-	-	-	-	-	-	-	-
Odor	**-**	muddy	muddy	muddy	muddy	muddy	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	-	90	75	55	60	40	70	70	80	60	190	60
EC	**µs**	1956	283	765	965	26.52	26.88	20.22	20.22	8.49	1486	495.4	150.2
pH	**-**	7	6.8	7.1	7.1	8.5	7.73	7.76	7.76	7.73	7.08	7.19	6.7
BOD	**mg/L**	3.2	3	2.5	2.1	1.5	1.5	1	1.5	1.5	2.2	1.5	1
SS	**mg/L**	540	584	1403	1739	549	78	78	78	136	136	422	118
DO	**mg/L**	5.2	5	5	4	7.57	4.5	4.5	4.5	3.46	4.68	60.5	52.9
SW-4													
Temp	**°C**	25.9	25.3	26.1	30.2	34.4	31.1	36	29.5	30.4	29.2	28.1	27
Flow*	**m^3/s**	0.078	0.067	0.055	0.055	0.046	0.041	0.042	0.042	-	-	-	-
Level/Depth**	**m**	-	-	-		-	-	-	-	-	-	-	-/2

Parameter	Unit	Sample Date											
		18/12/2013	2014/1/7	2014/1/30	2014/2/18	2014/3/14	2014/4/1	2014/4/25	2014/5/16	2014/6/3	2014/6/24	2014/7/15	2014/8/5
Odor	**-**	muddy	muddy	muddy	muddy	muddy	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	20	180	35	50	35	70	40	40	140	220	120	90
EC	**µs**	1669	189	297	951	29.74	26.93	22.92	22.92	13.63	5.26	900	291.3
pH	**-**	7.2	7	7.2	7.1	8.67	7.46	8.05	8.05	7.44	7.08	7.33	7.11
BOD	**mg/L**	3.2	3	2.7	2.1	2	2	2	1.5	2	2.5	2	1.5
SS	**mg/L**	615	571	1043	1615	190	128	128	128	385	1930	188	152
DO	**mg/L**	5.2	4	5.2	4	5.57	4.11	4.11	4.11	4.27	62.4	79.3	54.1
SW-5													
Temp	**°C**	25.1	25.7	26.4	31	30.4	31	33	29.5	30.8	29.9	28.2	27.3
Flow*	**m^3/s**	-	-	-	-	-	-	-	-	-	-	-	-
Level/Depth	**m**	- /0.2	- /0.23	- /0.22	- /0.2	- /0.18	- /0.28	- /0.8	-/0.3	-/0.4	-/2.4	-/0.7	-/2
Odor	**-**	foul	foul	muddy	foul	foul	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	40	110	280	70	25	90	30	30	60	130	40	70
EC	**µs**	1666	252	1344	713	14.92	31.95	33.95	33.95	151.6	4993	1611	300.8
pH	**-**	7.1	6.8	6.8	7.1	7.23	7.23	7.57	7.57	7.58	7.24	7.19	6.94
BOD	**mg/L**	1	3	2	2.5	1.5	2.5	2	1	2	2.5	2.5	1.5
SS	**mg/L**	1253	710	1354	1442	102	147	147	147	160	1460	92	195
DO	**mg/L**	5	4	5	4.5	5.4	4.73	4.73	4.73	4.22	52.8	55.2	43.5
SW-6													
Temp	**°C**	25.5	26.1	25.6	29.7	29.7	29.9	34.2	28.3	30.5	29.1	28.1	28.1
Flow*	**m^3/s**	-	-	-	-	-	-	-	-	-	-	-	-
Level/Depth	**m**	- /0.25	- /0.29	- /0.28	- /0.3	- /0.25	- /1.5	- /1.0	- /1.5	- /0.9	- /2.2	- /1.0	- /1.2
Odor	**-**	foul	foul	foul	foul	foul	fishy	fishy	fishy	fishy	fishy	fishy	fishy
Color	**TCU**	40	50	40	15	10	30	10	10	20	80	70	45
EC	**µs**	1891	262	1523	836	25.85	30.03	35.25	35.25	19.95	1405	568	80.3
pH	**-**	7.2	6.9	6.9	7.1	7.04	7.36	7.95	7.95	7.49	7.1	7.18	6.72
BOD	**mg/L**	2.2	3	2	2.5	2	1.5	2	1	2	2.5	2.5	1.5
SS	**mg/L**	1213	1477	998	1749	45	52	52	52	58	1220	116	98
DO	**mg/L**	5.2	4	4	4.5	4.01	3.8	3.8	3.8	54.6	50.2	50.8	43.5
GW-1													
Temp	**°C**	25.9	25.2	27	28.7	29.6	28.4	29.6	29.1	29.5	28.6	29.1	28.5
Water level	**m**	2.1/2.3	2.5/1.8	2.8/1.5	2.7/1.6	3.6 /0.9	4.3/2.7	4.3/3.1	4.3/3.0	2.5/1.5	1.2/4.3	1.1/4.4	1/4.3
Odor	**-**	rusty	rusty	nil	nil	nil	rusty	rusty	rusty	rusty	rusty	rusty	rusty
Color	**TCU**	5	20	nil	nil	nil	nil	nil	nil	nil	nil	nil	5
EC	**µs**	1478	110	256	974	98	87	79.9	79.9	124.4	95.7	102.3	58.8
pH	**-**	6.8	6.8	4	4	4.73	4.65	4.96	4.96	5.06	4.65	4.53	5.57
GW-2													
Temp	**°C**	26.2	25.9	27	27.2	28.6	28.8	29.9	29.2	28.8	28.8	28.7	28.8
Water level	**m**	3.8/2.5	2.9/2.4	2.7/2.9	3.1/2.4	6.4/2.1	6.4/2.1	6.4/1.4	6.4/1.8	3.2/1.5	1.8/4.7	1.5/4.0	1.1/4.1

Parameter	Unit	Sample Date											
		18/12/2013	2014/1/7	2014/1/30	2014/2/18	2014/3/14	2014/4/1	2014/4/25	2014/5/16	2014/6/3	2014/6/24	2014/7/15	2014/8/5
Odor	**-**	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	10
EC	**µs**	1461	101	105	653	54	50.8	68	68	59	67.4	62.7	58.6
pH	**-**	6	6	4.5	6	4.85	5.04	5.29	5.29	5.13	5.07	4.98	5.07
GW-3													
Temp	**°C**	25.8	24.8	27	26.1	29.3	28.4	31	29.3	29.6	29.3	29.2	28.9
Water level	**m**	2.5/3.5	2.3/3.5	3.5/2.8	3.3/3.0	4.2/2.2	4.2/1.6	4.2/1.7	4.2/3.7	0.6/5.6	1.1/5.2	0.7/5.3	0.8/5
Odor	**-**	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil	nil
Color	**TCU**	30	25	5	nil	nil	nil	nil	nil	nil	nil	nil	nil
EC	**µs**	1492	90	454	640	124.5	141.3	223.5	223.5	219.1	89.7	68.7	106.6
pH	**-**	6	6.2	5.5	4	4.85	6.37	6.82	6.82	6.05	5.8	5.53	4.6

Note: flow and depth measurements were taken at low tide to identify off-site flow and to minimize the impact of tidal fluctuations on measured values.
*Flow measurements were only able to be taken intermittently due to blockage of rivers by local residents for agricultural activities.
**Depth measurements were nil at low tide.
Source: SEZ Management Committee

Table 8 Surface Water Sampling Dry Season Results (Extended Parameter Set)

Parameter	Unit	Quantitative Target	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
Total Coliform	**cfu/100mL**	**-**	$3.5x10^3$	$2x10^3$	$1.5x10^3$	$8x10^3$	$2.3x10^3$	$6x10^3$
COD	**mg/L**	**-**	1.84	1.104	ND	2.208	3.680	0.368
Total Nitrogen	**mg/L**	**-**	6.3	3.5	19.6	7.7	21.00	7.70
Total Phosphorous	**mg/L**	**-**	0.004	0.028	0.036	0.044	0.028	0.084
Turbidity	**NTU**	**-**	171	1220	1310	1450	2250	13
Arsenic (As)	**mg/L**	**0.340**	10.9	7.4	9.5	8.2	8.6	7.838
Mercury (Hg)	**mg/L**	**0.0014**	ND	ND	0.003	0.004	0.006	0.007
Lead (Pb)	**mg/L**	**0.065**	0.025	0.017	0.034	0.03	0.12	0.065
Cadmium (Cd)	**mg/L**	**0.002**	ND	ND	ND	ND	ND	ND
Chromium (CrVI)	**mg/L**	**0.016**	1.75	1.67	1.81	1.48	1.45	3.8
Copper (Cu)	**mg/L**	**0.0023**	0.018	0.017	0.017	0.016	0.02	0.022
Zinc (Zn)	**mg/L**	**0.12**	0.01	0.013	0.007	0.015	0.03	0.075
Nickel (Ni)	**mg/L**	**0.47**	0.18	0.17	0.181	0.185	0.283	0.95
Iron (Fe)	**mg/L**	**-**	0.88	2.20	2.60	3.72	4.6	0.58
Cyanide (CN)	**mg/L**	**0.022**	0.002	0.009	0.006	0.005	0.002	0.008

ND=Not Detected
Source: SEZ Management Committee Study

Table 9 Groundwater Sampling Dry Season Results (Extended Parameter Set)

Parameter	Unit	Quantitative Target	GW-1	GW-2	GW-3
Total Coliform	**cfu/100mL**	**ND**	1 x10^2	2 x10^2	5 x10^2
Arsenic (As)	**mg/L**	**0.01**	3.682	ND	6.9
Mercury (Hg)	**mg/L**	**0.006**	0.019	0.033	0.093
Lead (Pb)	**mg/L**	**0.01**	ND	ND	ND
Cadmium (Cd)	**mg/L**	**0.003**	ND	ND	ND
Chromium (Cr)	**mg/L**	**0.05**	1.07	0.998	1.43
Copper (Cu)	**mg/L**	**2**	0.002	0.002	0.002
Zinc (Zn)	**mg/L**	**-**	0.04	0.029	0.003
Nickel (Ni)	**mg/L**	**0.07**	0.093	0.065	0.061
Iron (Fe)	**mg/L**	**-**	0.20	0.22	0.28
Cyanide (CN)	**mg/L**	**-**	0.002	0.005	0.004
Fluoride	**mg/L**	**1.5**	ND	ND	ND
Hardness	**mg/L**	**-**	6	6	20
Nitrates (NO3-N)	**mg/L**	**50**	0.104	0.120	0.98
Nitrites (NO2-N)	**mg/L**	**3**	0.01	ND	ND
Ammonium Nitrogen (NH4)	**mg/L**	**-**	ND	ND	ND

ND=Not Detected
*WHO do not specify specific targets for these items.
Source: SEZ Management Committee Study

Table 10 Surface Water Sampling Rainy Season Results (Extended Parameter Set)

Parameter	Unit	Quantitative Target	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
Total Coliform	**cfu/100mL**	**-**	0.1x10^3	Numerous	Numerous	Numerous	Numerous	Numerous
COD	**mg/L**	**-**	32	32	32	32	32	32
Total Nitrogen	**mg/L**	**-**	4.2	7.7	8.4	8.4	7.7	5.6
Total Phosphorous	**mg/L**	**-**	0.07	0.1	0.09	0.02	0.08	0.11
Turbidity	**NTU**	**-**	255	630	228	750	725	678
Arsenic (As)	**mg/L**	**0.340**	Nil	Nil	Nil	Nil	Nil	Nil
Mercury (Hg)	**mg/L**	**0.0014**	ND	ND	ND	ND	ND	ND
Lead (Pb)	**mg/L**	**0.065**	ND	ND	ND	ND	ND	ND
Cadmium (Cd)	**mg/L**	**0.002**	ND	ND	ND	ND	ND	ND
Chromium (CrVI)	**mg/L**	**0.016**	ND	ND	ND	ND	ND	ND
Copper (Cu)	**mg/L**	**0.0023**	ND	ND	ND	ND	ND	ND
Zinc (Zn)	**mg/L**	**0.12**	0.001	0.007	ND	ND	0.001	ND
Nickel (Ni)	**mg/L**	**0.47**	ND	ND	ND	ND	ND	ND
Iron (Fe)	**mg/L**	**-**	3.88	6.2	4.22	8.3	6.92	6.25

Parameter	Unit	Quantitative Target	SW-1	SW-2	SW-3	SW-4	SW-5	SW-6
Cyanide (CN)	**mg/L**	**0.022**	0.02	0.03	0.016	0.017	0.031	0.033

ND=Not Detected
Source: SEZ Management Committee Study

Table 11 Groundwater Sampling Rainy Season Results (Extended Parameter Set)

Parameter	Unit	Quantitative Target	GW-1	GW-2	GW-3
Total Coliform	**cfu/100mL**	**ND**	Numerous	Numerous	Numerous
Arsenic (As)	**mg/L**	**0.01**	ND	ND	ND
Mercury (Hg)	**mg/L**	**0.006**	ND	ND	ND
Lead (Pb)	**mg/L**	**0.01**	ND	ND	ND
Cadmium (Cd)	**mg/L**	**0.003**	ND	ND	ND
Chromium (Cr)	**mg/L**	**0.05**	ND	ND	ND
Copper (Cu)	**mg/L**	**2**	ND	ND	ND
Zinc (Zn)	**mg/L**	**-**	0.03	ND	ND
Nickel (Ni)	**mg/L**	**0.07**	ND	ND	ND
Iron (Fe)	**mg/L**	**-**	0.26	0.92	0.79
Cyanide (CN)	**mg/L**	**-**	0	0.007	0.002
Fluoride	**mg/L**	**1.5**	0.5	0.6	0.5
Hardness	**mg/L**	**-**	20	12	16
Nitrates (NO3-N)	**mg/L**	**50**	Nil	Nil	Nil
Nitrites (NO2-N)	**mg/L**	**3**	0.37	0.36	0.77
Ammonium Nitrogen (NH4)	**mg/L**	**-**	Nil	Nil	Nil

ND=Not Detected
*WHO do not specify specific targets for these items.
Source: SEZ Management Committee Study

For dry season results, both surface water and groundwater show similar tendency for analytical results. In six samples (SW-1 to SW-6) corrected from surface water points during dry season, laboratory measurements of Arsenic, Crromium VI, and Copper exceeded the quantitative target, 0.340mg/L, 0.016mg/L, and 0.0023mg/L respectively. Also, Mercury was detected at four samples (SW-3, SW-4, SW-5, and SW-6), and Lead and Nicke was detected at SW-5 and SW-6 respectively. For rainy season results, only Cyanide, which was not detected from samples collected during dry season, was detected from three surface water samples (SW-2, SW-5, and SW-6). Since no operation or pollution sources are present and tendency of detection changes depending on the season, the elevated concentrations from both the surface water and groundwater samples is naturally occuring and has seasonal effect.

1.2.3 Wastewater

1） Quantitative Target

In industrial parks both in Myanmar and in other countries, it is now a common practice to establish a two-step effluent quality checkpoint system whereby wastewater effluent standards are set both at the individual factory level and further on at the SEZ-wide level. The 2,000ha area standards will reflect those employed in the Class A zone while also taking care to adopt national standards as they come into force as a minimum. The table below shows various standards available for consideration. In principle, the 2,000ha area will use the same standards as in the Class A zone.

Table 12 Wastewater Effluent Standards

Parameter	Unit	Class A	Dowa Waste Facility	IFC	China	Vietnam	MEP	MOI	MOM	YCDC
Physical										
Temperature	°C	**35**	40	-	-	40-45	-	40	-	-
Temp. ∆@zone of discharge	°C	-	-	**<3**	-	-	-	-	-	-
Dissolved Solids	mg/L	**2,000**	**2,000**	-	-	-	-	**2,000**	-	-
Suspended Solids	mg/L	**30**	**30**	50	20-800	50-200	50	**30**	-	<500
Coliform Bacteria	MPN/ 100ml	**<400**	-	**<400**	-	5-10,000	**<400**	-	-	-
Color/Odor	Co-Pt	**150**	Not objectionable	-	-	-	-	-	-	-
Chemical										
pH	units	**6.5-8.5**	5-9	6-9	6-9	5-9	6-9	5-9	6-9	6-9
Total Heavy Metals	mg/L	-	-	10.0	-	-	**10.0**	-	-	-
Iron (Fe)	mg/L	-	-	**3.5**	-	1.0-10.0	**3.5**	-	-	-
Zinc (Zn)	mg/L	5.0	5.0	**2.0**	2.0-5.0	1.0-5.0	**2.0**	5.0	-	-
Copper (Cu)	mg/L	1.0	1.0	**0.5**	0.5-2.0	0.2-5.0	**0.5**	1.0	-	-
Silver (Ag)	-	-	-	**0.5**	**0.5**	-	**0.5**	-	-	-
Chromium (Cr)	mg/L	0.5	0.5	**0.1**	0.5	0.05-0.5	**0.1**	0.5	-	-
Cadmium (Cd)	mg/L	**0.03**	**0.03**	0.1	0.1	0.01-0.5	0.1	**0.03**	-	-
Total Mercury (Hg)	mg/L	**0.005**	**0.005**	0.01	0.05	0.005-0.01	0.01	**0.005**	-	-
Barium	mg/L	**1.0**	**1.0**	-	-	-	-	**1.0**	-	-
Nickel (Ni)	mg/L	**0.2**	**0.2**	0.5	1.0	0.2-2.0	0.5	**0.2**	-	-
Phosphate (PO_4-P)	mg/L	-	-	**2.0**	-	-	-	-	-	-
Lead (Pb)	mg/L	0.2	0.2	**0.1**	1.0	0.1-1.0	**0.1**	0.2	-	-
Arsenic (As)	mg/L	0.25	0.25	**0.1**	0.5	0.05-0.5	**0.1**	0.25	**0.1**	-
Selenium (Se)	mg/L	**0.02**	**0.02**	0.1	-	-	0.1	**0.02**	-	-
Cyanide	mg/L	**0.2**	**0.2**	1.0	0.5-1.0	-	1.0	**0.2**	-	-
Sulfide (S)	mg/L	1.0	1.0	1.0	1.0	**0.2-1.0**	1.0	1.0	-	-
Fluoride	-	-	-	20.0	10.0-30.0	**1.0-5.0**	20.0	-	-	-
Chlorine (Cl_2)	mg/L	1.0	1.0	**0.2**	-	-	-	1.0	-	-
Formaldehyde	mg/L	**1.0**	**1.0**	-	-	-	-	**1.0**	-	-
Permanganate	mg/L	-	**60**	-	-	-	-	-	-	-
Oxygen Demand										
Biological (BOD)	mg/L	**20**	20-60	50	20-600	20-100	50	20-60	-	20-60
Chemical (COD)	mg/L	**60 (Cr)** 35 (Mn)	-	250	60-1,000	50-400	250	-	150	<200

Parameter	Unit	Class A	Dowa Waste Facility	IFC	China	Vietnam	MEP	MOI	MOM	YCDC
Free Ammonia (NH3-N)	mg/L	-	-	-	-	**0.1-10.0**	10.0	-	-	-
Total Nitrogen (T-N)	mg/L	**5.0**	-	10.0	-	**-**	-	-	-	-
Other										
Phenols / cresols	mg/L	1.0	1.0	**0.5**	0.5-2.0	0.001-1.0	**0.5**	1.0	-	-
Mineral Oil (hydrocarbons)	mg/L	**5**	**5**	10	20-100	-	10	**5**	15	-
Tar	-	**ND**	**ND**	-	-	-	-	**ND**	-	-
Radioactivity and insecticides	-	**ND**	**ND**	-	**ND**	-	-	**ND**	-	-

Acronyms: ND=non-detected; IFC=International Finance Corporation; MEP=Ministry of Electrical Power; MOI=Ministry of Industry; MOM=Ministry of Mines; YCDC=Yangon City Development Committee
Notes: Bolded items represent the strictest standards for each regulation.
Source: Referenced from consultation with MOECAF ESQ Subcommittee #17 on Air Quality Standards, Water Quality Standards, Drinking Water Standards, and Pesticide Residue Specifications.

2） Survey Results

There are no existing wastewater sources on the site to survey.

1.2.4 Solid Waste

1） Quantitative Target

The project should secure the capacity to dispose of hazardous, non-hazardous, and household wastes in a responsible manner. In concrete terms, waste planning activities should include waste planning, waste prevention, and recycling/reuse in order to reduce the total amount of waste to the extent possible. After such activities are undertaken, waste materials should be treated and disposed of an all measures taken to avoid potential impacts to human health and the environment. Approaches should include:

- Provision of on-site or off-site biological, chemical or physical treatment of waste to render it non-hazardous prior to final disposal;
- Treatment or disposal at permitted facilities specifically designed to receive the waste; and
- Provision of relevant documentation to demonstrate that waste is handled properly throughout the waste life cycle from generation to final disposal.

The project will send all generated waste to Dowa Eco-System's solid waste treatment facility in the Class A area. Both non-hazardous and hazardous waste should be stored properly on site until the waste custody is transferred to Dowa's waste transport vehicles. During storage on site,

2） Survey Results

Dowa Eco-System Ltd., a Japan-based company, has received approval for and is

constructing a solid waste treatment facility in the western portion of the Class A area. This facility will receive solid waste from the entire SEZ area as a priority. The location of this facility vis-à-vis the project is outlined in the figure below.

Source: Dowa Eco-System Ltd. (2015). Project on Construction of Solid Waste Management Facilities in Thialwa SEZ Class A Area

Figure 5 Location of Solid Waste Management Facility

According to the EIA report for this facility, the facility will receive industrial non-hazardous, hazardous and recyclable waste. The proposed capacity for the project is as follows:

(i) Recyclables, hazardous and non-hazardous waste disposal (including incineration/landfilling): 10,000-30,000 tons/year (30-80 tons/day)

(ii) Non-hazardous waste incineration: 20 tons/day (<1 ton/hr)

1.2.5 Soil and Sediment

1） Quantitative Target

Like other parameters, there are currently no domestic regulations in Myanmar for soil quality. IFC EHS Guidelines recommend using USEPA Region 3 Risk-Based Concentrations (RBCs)[3] or the Dutch Intervention Values as stipulated in Lijzen et al. 2001[4] in the absence of site-specific national or sub-national regulations. These parameters are a risk-based assessment good for specific land use and contaminant exposure scenarios. However they are practically difficult to implement in Myanmar for general ambient soil quality due to current capacity constraints as laboratories that can measure the full scope of contaminants identified in these two standards. Before national guidelines are established, from a human health standpoint, the WHO Guidelines for the Safe Use of Wastewater, Excreta, and Greywater provide a useful benchmark to evaluate the baseline condition of the soil in the Project area.

Table 13 Selected Quantitative Soil Quality Targets

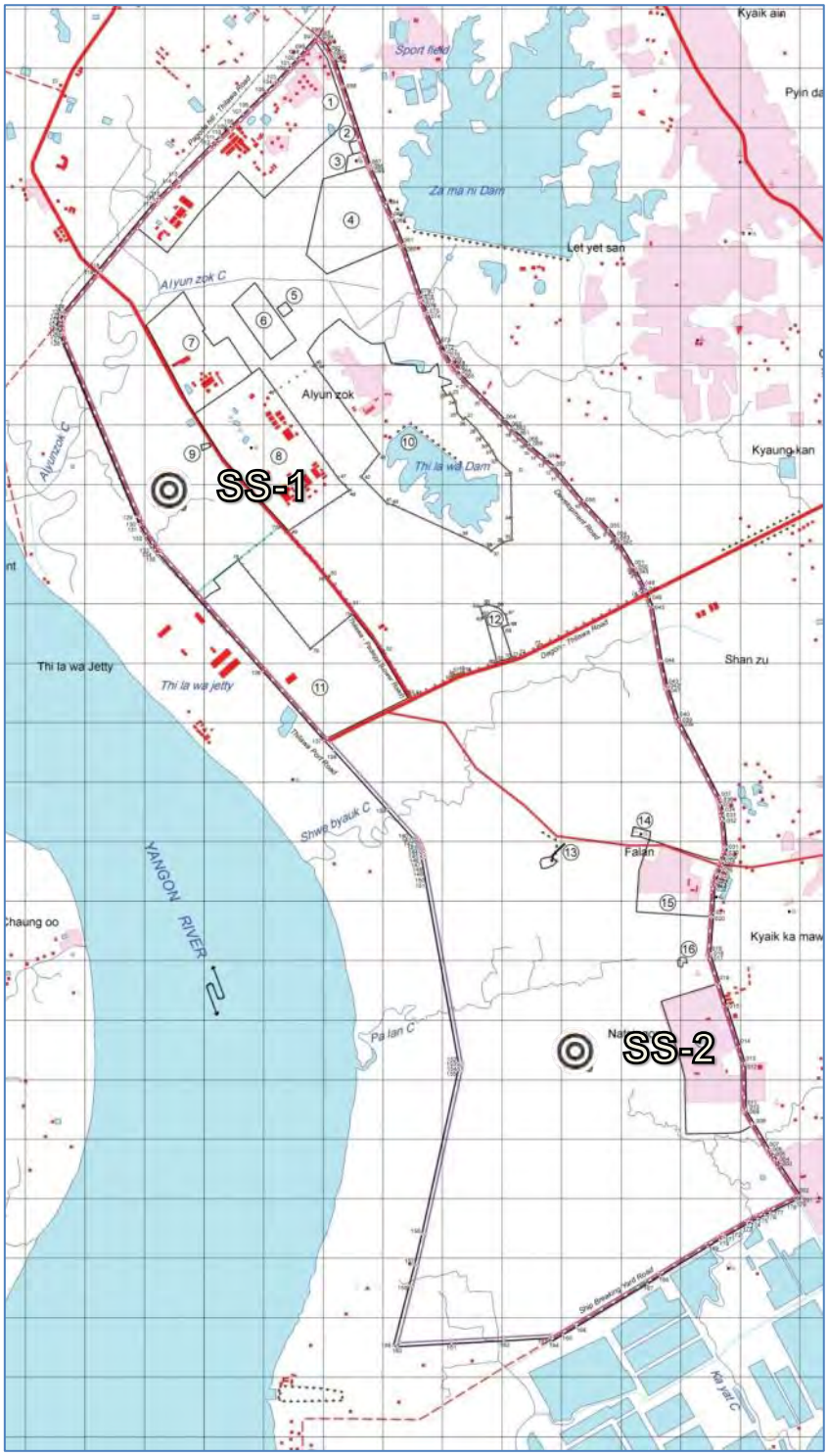
Parameter	Unit	WHO Maximum tolerable soil concentrations of various toxic chemicals based on human health protection
Cadmium	mg/kg	<4.0
Chromium	mg/kg	-
Lead	mg/kg	<84.0
Arsenic	mg/kg	<8.0
Mercury	mg/kg	<7.0
Copper	mg/kg	-
Zinc	mg/kg	-

Source: WHO, Guidelines for the Safe Use of Wastewater, Excreta, and Greywater

2） Survey Results

A soil contamination survey was undertaken at two points as shown in the figure below.

[3] http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm
[4] http://www.pbl.nl/sites/default/files/cms/publicaties/711701023.pdf



Source: SEZ Management Committee

Figure 6 Baseline Soil Sampling Points

Table 14 Baseline Soil Contamination

Parameter	Unit	WHO Recommended Maximum Soil Concentrations for Agricultural Purposes	Measured result	
			SS-1	SS-2
Cadmium	mg/kg	<4.0	1.35	1.65
Chromium (total)	mg/kg	-	47.12	63.75
Lead	mg/kg	<84.0	13.97	25.8
Arsenic	mg/kg	<8.0	ND	ND
Mercury	mg/kg	<7.0	ND	ND
Copper	mg/kg	-	7.6	17.12
Zinc	mg/kg	-	28.95	155.85

Source: SEZ Management Committee

The Project area is green-field. Given the past activity of the area, agricultural and residential with some light industry, a limited parameter set was evaluated for naturally occurring metals. When compared to WHO threshold levels, the soil samples taken from each of these sample points did not show any contamination beyond guideline values. However, there were slight elevations in Chromium, Lead, and Cadmium that are possibly a result of natural lateritic soil content.

Regarding sediment, according to the Japanese report written for “The Enhancement of the Efficient Operation of Thilawa Area Port and Logistics Depot Project”, it is reported that concentration of heavy metals (copper and nickel) in the sediment of Yangon River was exceeded a screening level.

1.2.6 Noise and Vibration

1） Quantitative Target

There are no regulations requiring a certain noise threshold currently under Myanmar domestic law. However there are quantitative targets under the Draft National Environmental Quality (Emission) Guidelines as below. According to the Draft Guidelines, Noise impacts should not exceed the levels presented below or result in a maximum increase in background levels of 3dBA at the nearest receptor location off-site.

Table 15 Noise Level Standards

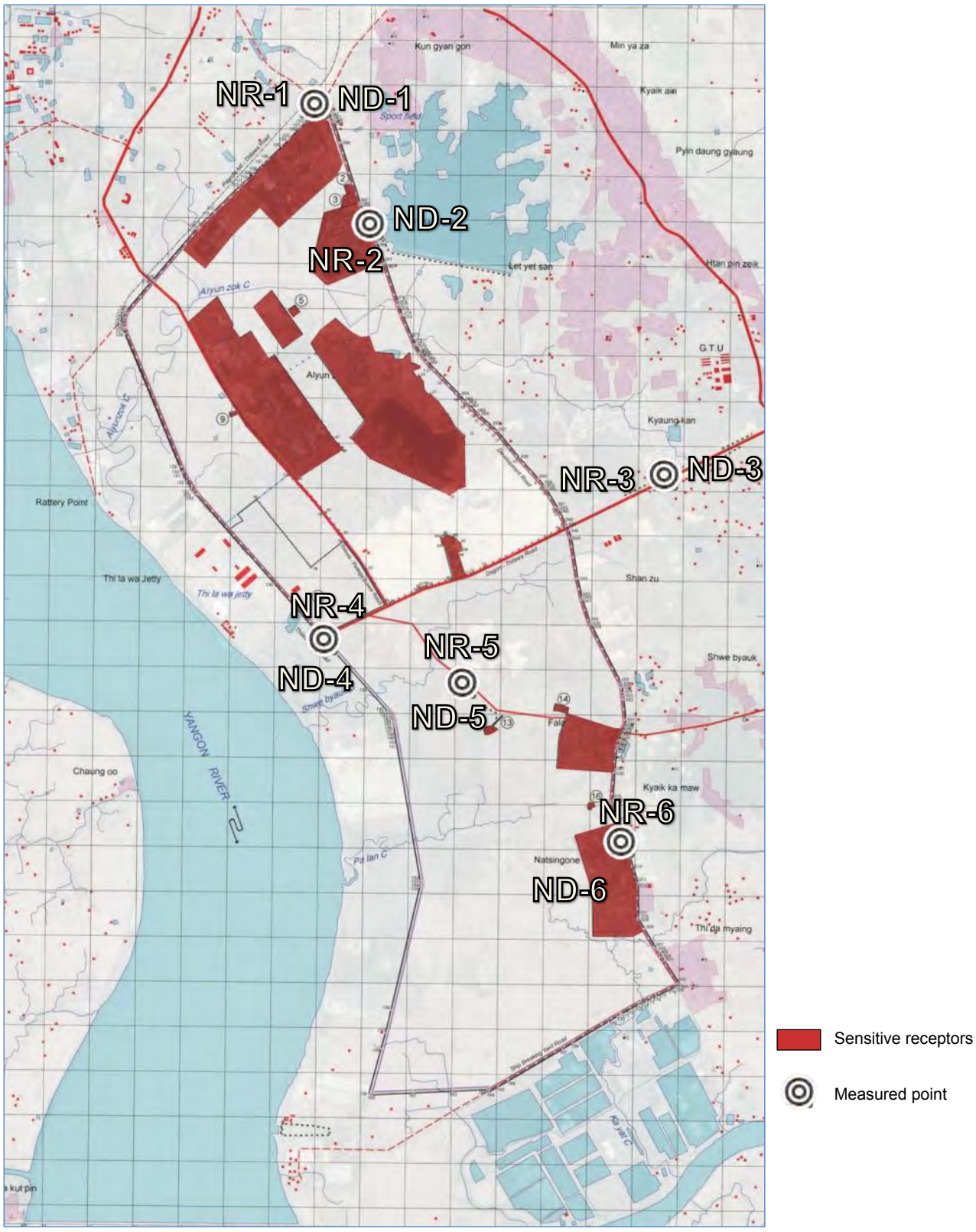
Receptor	One Hour LAeq (dBA)	
	Daytime 07:00-22:00 (10:00-22:00 for public holidays)	**Nighttime 22:00-07:00** (22:00-10:00 for public holidays)
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70

Source: Draft National Environmental Quality (Emission) Guidelines

2） Survey Results

In the case of the Project, residences and educational facilities border the site. Care should

be taken to reduce noise impacts below +3dBA at these sensitive receptors highlighted in red below and at the outside border of the site.



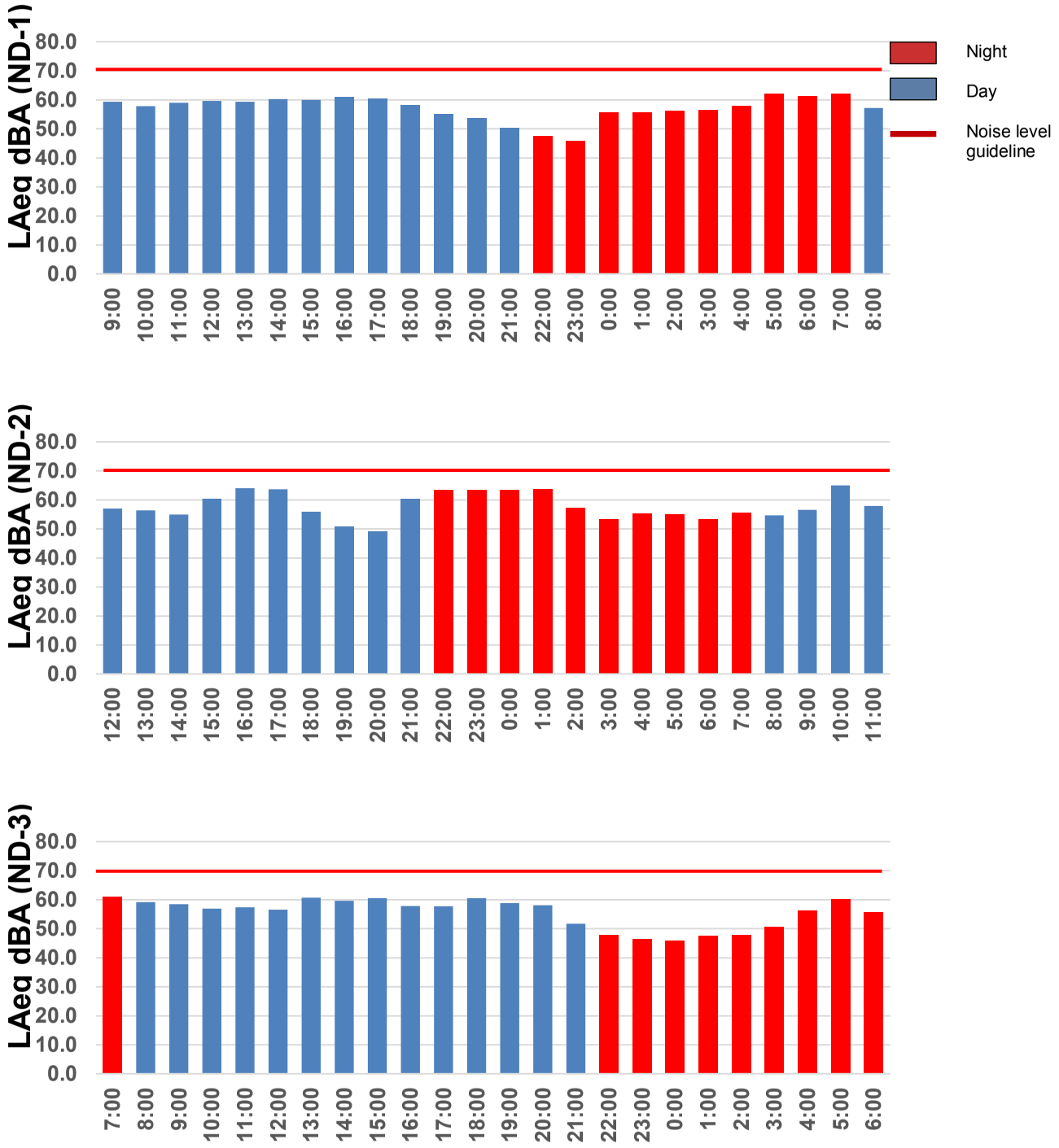
Source: SEZ Management Committee

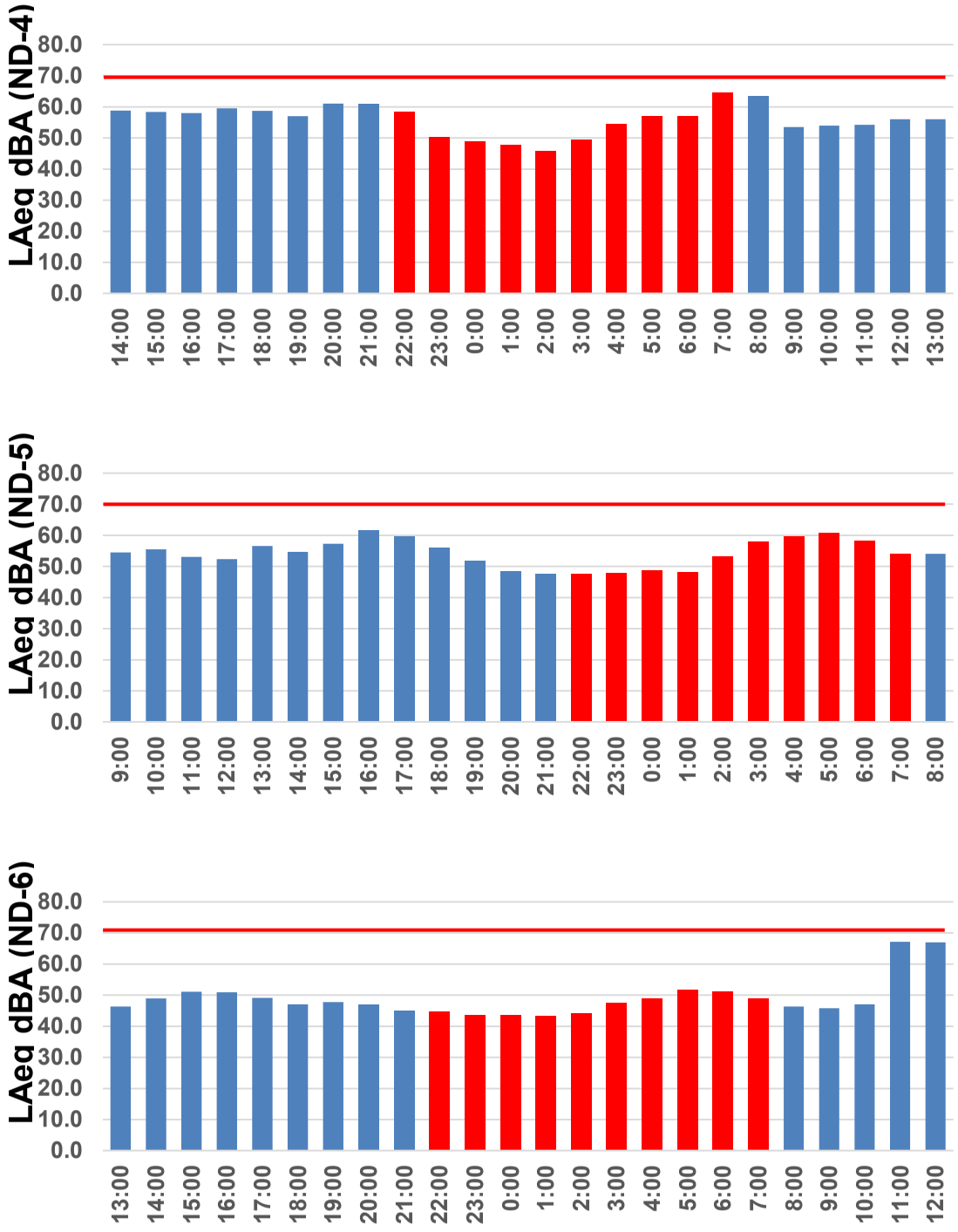
Figure 7 Potentially Sensitive Noise Receptors and Location of Noise Survey

A noise monitoring campaign was undertaken from 20 May 2014 to 6 June 2014 in six different locations identified in the figure below for a period of 24 hours at each location. The

results of this survey are below.

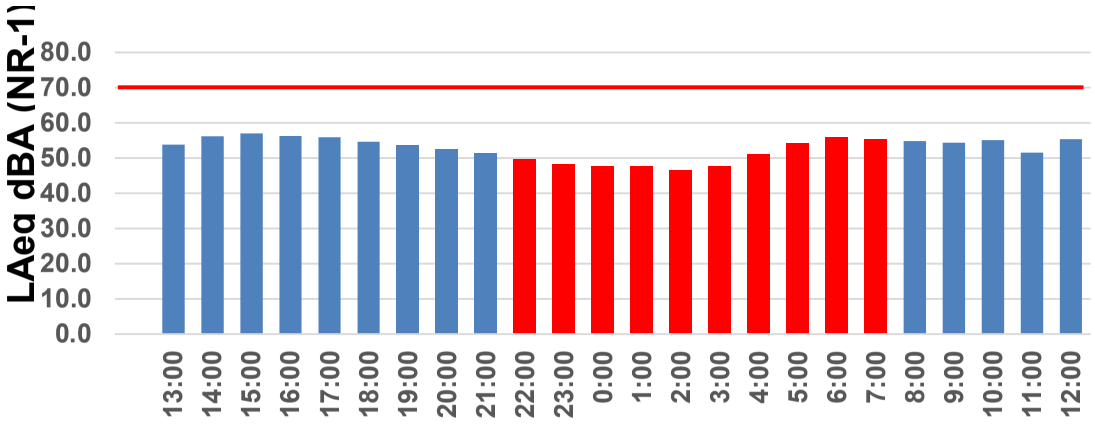
Figure 8 Measured Noise Levels Dry Season (Points ND-1 to ND-6)

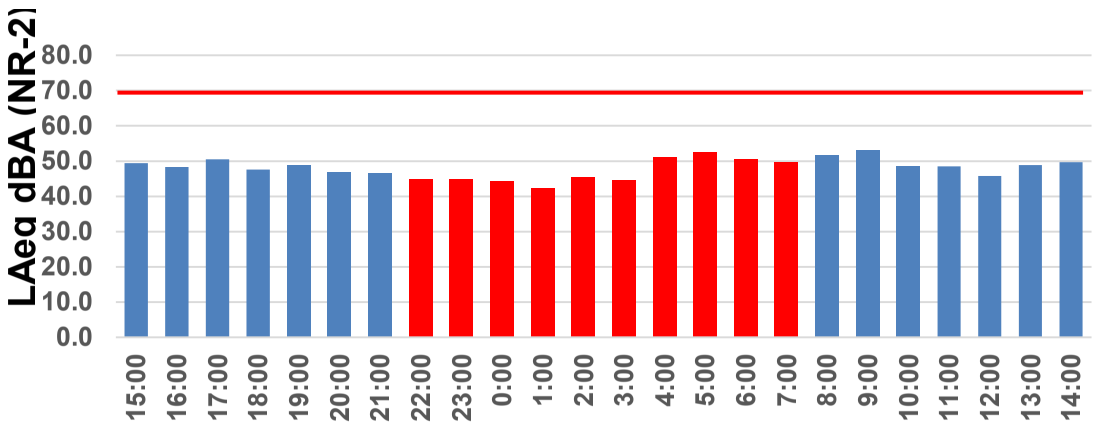


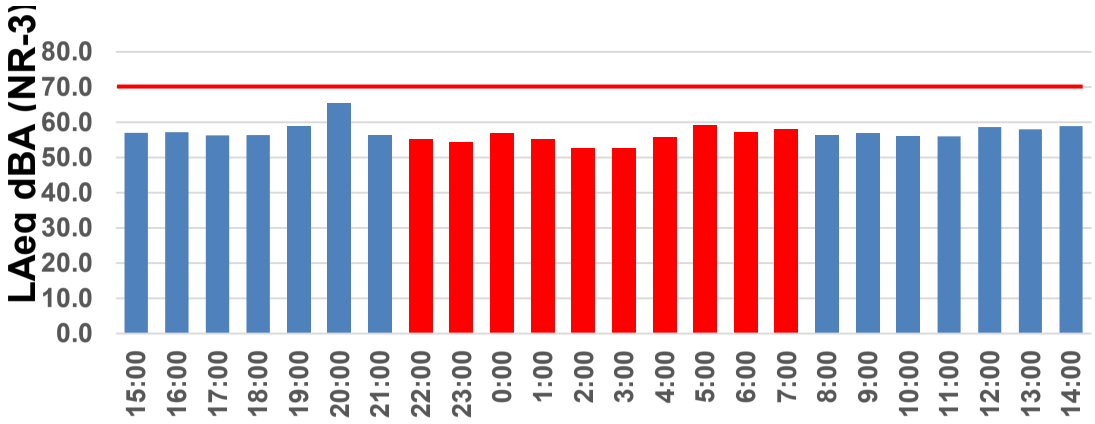


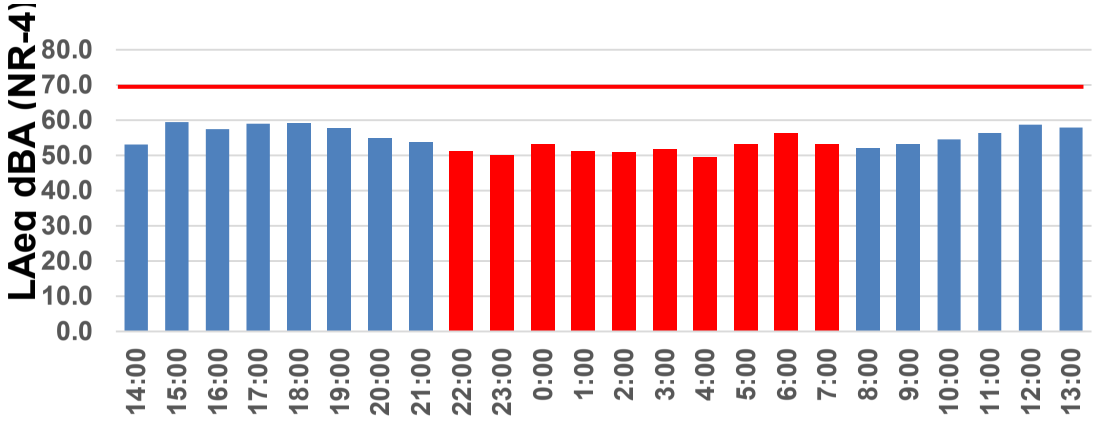
Source: SEZ Management Committee Study

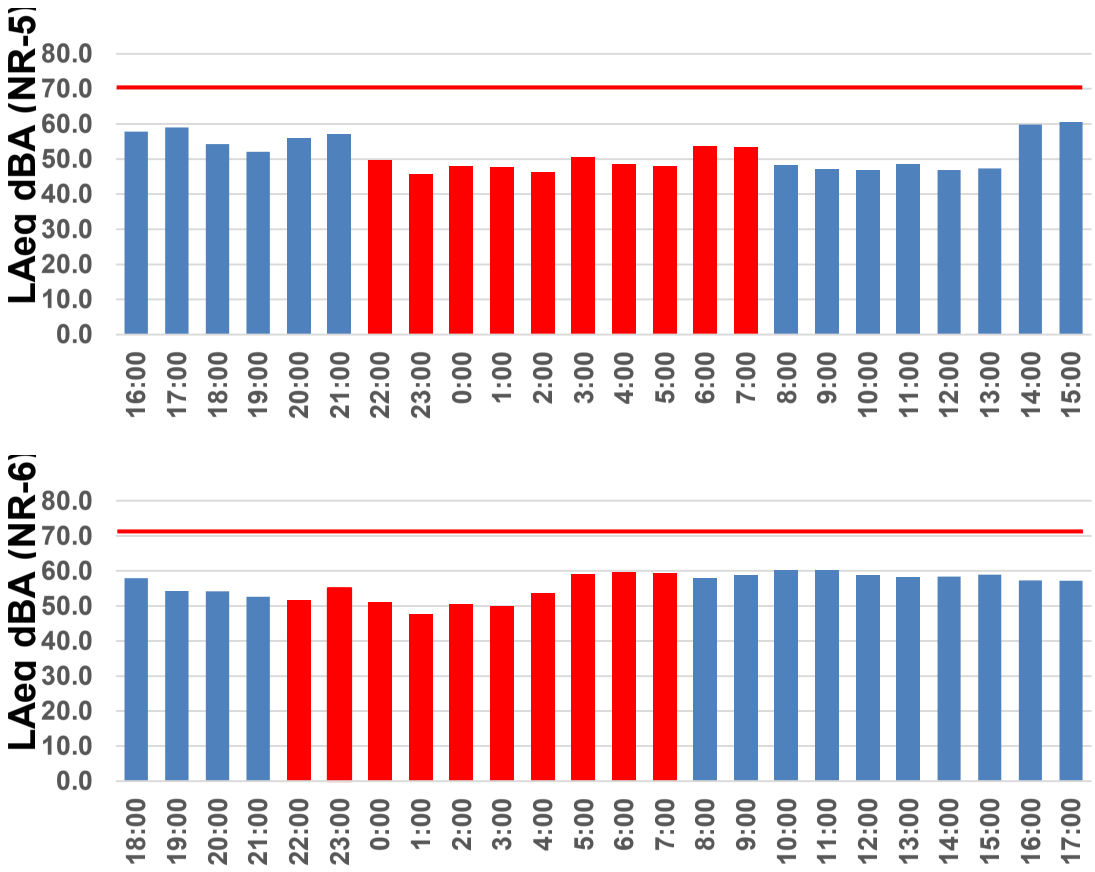
Figure 9 Measured Noise Levels Rainy Season (Points NR-1 to NR-6)


LAeq dBA (NR-1)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00


LAeq dBA (NR-2)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00


LAeq dBA (NR-3)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00


LAeq dBA (NR-4)
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00



Source: SEZ Management Committee Study

1.2.7 Traffic

The traffic survey was carried out on two different times, on 20 May 2014 and on 3 April 2015 in 4 locations each time. A map of the traffic survey locations is below.

Source: SEZ Management Committee

Figure 10Traffic Sampling Points

The traffic area surveys were conducted over a 24 hour period at each point identified in the Figure above. The traffic surveys were conducted on 19 August 2014 and 29 April 2015. These periods were chosen for two reasons. The first and principle reason for these date choices was to provide a time period to evaluate change over the course of a half year as

the construction in and around the SEZ was assumed to lead to an increase in traffic. A secondary reason for this timing was to implement the traffic survey during the end of the dry season when preparations for planting and construction traffic around the zone is relatively high. Construction traffic slows due to road conditions and construction conditions during the rainy season. Traffic volume was estimated based on manual counts of vehicles according to vehicle type: motorbike, sedan, light truck, heavy truck, and bus/transporter. Time was categorized into Midnight (00:00~05:59), Morning (06:00~11:59), Afternoon (12:00~17:59), and Evening (18:00~23:59). The results of this survey are as below. The traffic survey data is in the appendix to this report.

1） Survey Point J-1

Survey point J-1 is a 4 way intersection near the Technological University where the Thanlyin-Kyauktan Road on a NW/SE axis intersects Thilawa Road on a SW/NE axis. This road was chosen as it is situated on what will in the future be a major route for cargo into Yangon City over the Dagon Bridge. This route is also proximate to the Technological University which may be impacted by the expected increase in traffic along this route.

The results of the survey at J-1 are as below.

Table 16 Traffic Volume by Modal Type (J-1)

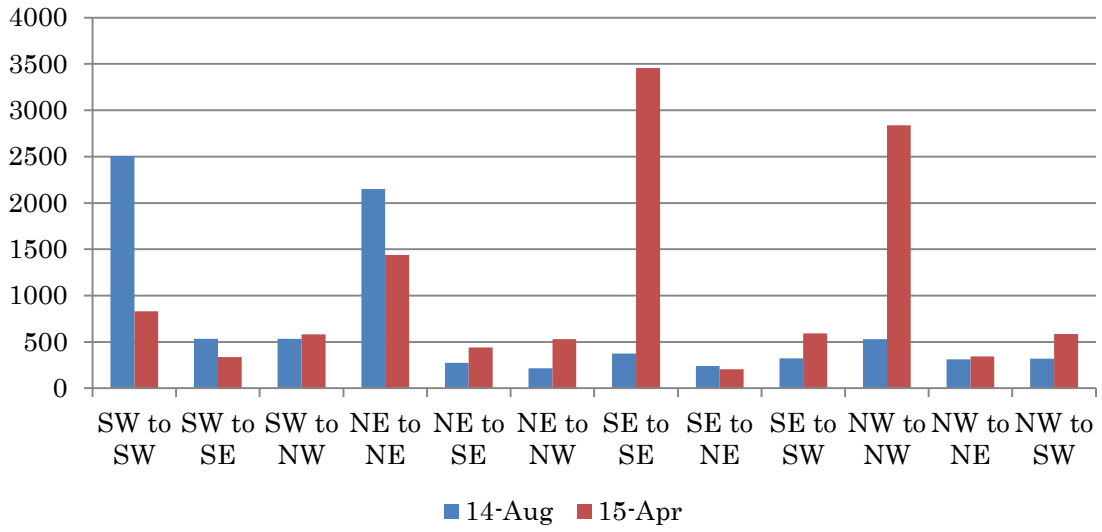
Modal Type	Aug-14				Apr-15			
	Midnight	Morning	Afternoon	Evening	Midnight	Morning	Afternoon	Evening
Motorcycle	125	1339	1419	668	133	1171	1501	832
Sedan	125	701	808	281	152	1162	1720	770
Light Truck	131	421	469	132	100	711	800	541
Heavy Truck	25	121	167	116	7	284	336	95
Bus	126	437	408	294	121	670	723	347
Total	**532**	**3019**	**3271**	**1491**	**513**	**3998**	**5080**	**2585**

Source: SEZ Management Committee Consultants

The survey results suggest that modal type share by time of day remains relatively consistent. However, the 2015 data indicated a slight increase in sedan modal share during the afternoon.

The survey results by total traffic volume by type suggest that Motorcycle traffic has remained relatively constant between the two study points while modal share of sedan and light truck vehicles has increased the most.

Traffic volume by day has increased over the study period in total but the volume of traffic by time of day has remained relatively consistent on a proportional basis with afternoon times experiencing the greatest amount of traffic followed by morning times.



Source: SEZ Management Committee Consultants

Figure 11 Origin and Destination of Traffic (J-1)

The data show an interesting result in that there has been a shift of traffic originating along the Thilawa Road on the NE/SW axis to traffic originating on the Thanlyin-Kyauktan Road on a NW/SE axis. Whereas destination used to be mostly on the NE/SW axis going in and out of Thilawa presumably to the Dagon Bridge access point, there was a marked shift to a higher usage of the Thanlyin-Kyauktan Road. This may be to use the road as an access link between Thanlyin and Kyauktan areas to avoid traffic near the Thilawa area.

2) Survey Point J-2

Survey point J-2 is a 4 way intersection at the eastern edge of the Thilawa SEZ and will presumably be a primary entry/exit point to the industrial areas in the Thilawa SEZ in the future. The road was chosen due to its presumed future role as a high-traffic intersection. This intersection is just north of the Thilawa domestic industrial park and is situated along the Thilawa road on a SW/NE axis and Development Road going to Myanmar Marine University approximately 4km north of the intersection.

The results of the survey at J-2 are as below.

Table 17 Traffic Volume by Modal Type (J-2)

Modal Type	Aug-14				Apr-15			
	Midnight	Morning	Afternoon	Evening	Midnight	Morning	Afternoon	Evening
Motorcycle	55	893	675	335	58	1399	1004	874
Sedan	6	206	250	61	20	282	430	199
Light Truck	9	126	117	38	22	317	307	169
Heavy Truck	57	82	73	23	94	100	152	131
Bus	77	144	228	131	50	531	465	208
Total	**204**	**1451**	**1343**	**588**	**244**	**2629**	**2358**	**1581**

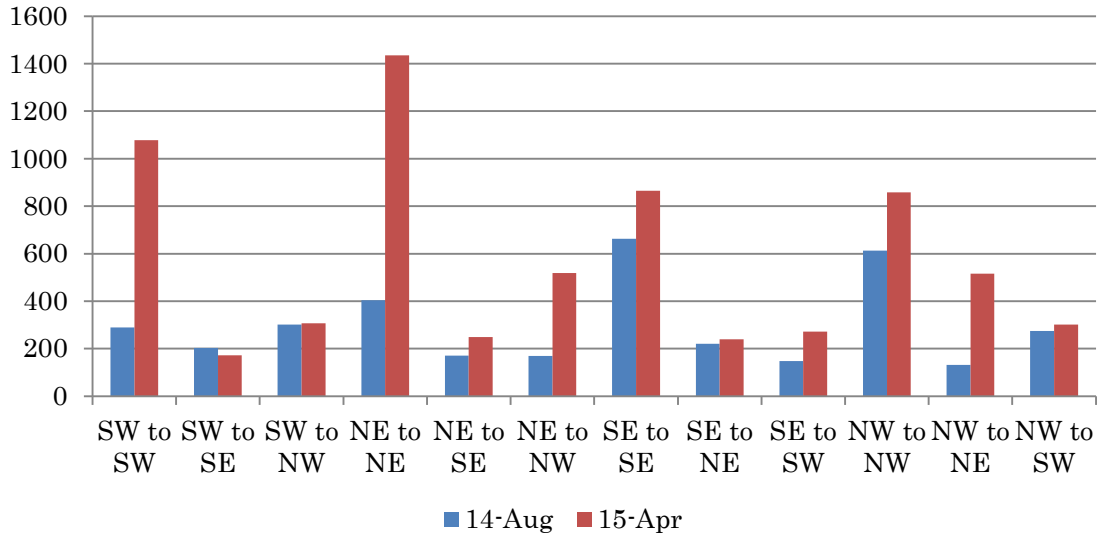
Source: SEZ Management Committee Consultants

The survey results suggest that modal type share by time of day remains relatively

consistent over the period other than a large increase in bus traffic during the morning and afternoon hours.

The survey results by total traffic volume have increased significantly over the period while the modal share has shifted to buses and light trucks. It is assumed that the construction of the Class A area has some impact on this modal shift.

Traffic volume by day has increased over the study period in total but the volume of traffic by time of day has remained relatively consistent on a proportional basis with morning times experiencing the greatest amount of traffic followed by afternoon times.



Source: SEZ Management Committee Consultants

Figure 12Origin and Destination of Traffic (J-2)

The data show that there was fairly even traffic volume distribution by origin in 2014 but that this shifted significantly to traffic volume originating from the NE areas. SW origin traffic also received a particularly large increase over the time period studied. This change is presumably from construction traffic going into the Class A area from the Dagon Bridge route.

3) Survey Point J-3

Survey point J-3 is a 4 way intersection located at the northern corner of the Thilawa SEZ. This location was chosen as it is a primary intersection for traffic entering and exiting the Thanlyin town area and Thanlyin Bridge route and moving to the Thilawa SEZ and surrounding areas south. The intersection is about 1km SW of Kyaik Kyauk Pagoda and about 700m north of the entrance to the Myanmar Marine University. Going SW from the intersection there are residential and light industrial areas existing along the road. The intersection is made up of Pagoda-Hill-Thilawa Road running along a SW/NE axis and

Development Road running on a SE/NW axis.

The results of the survey at J-3 are as below.

Table 18 Traffic Volume by Modal Type (J-3)

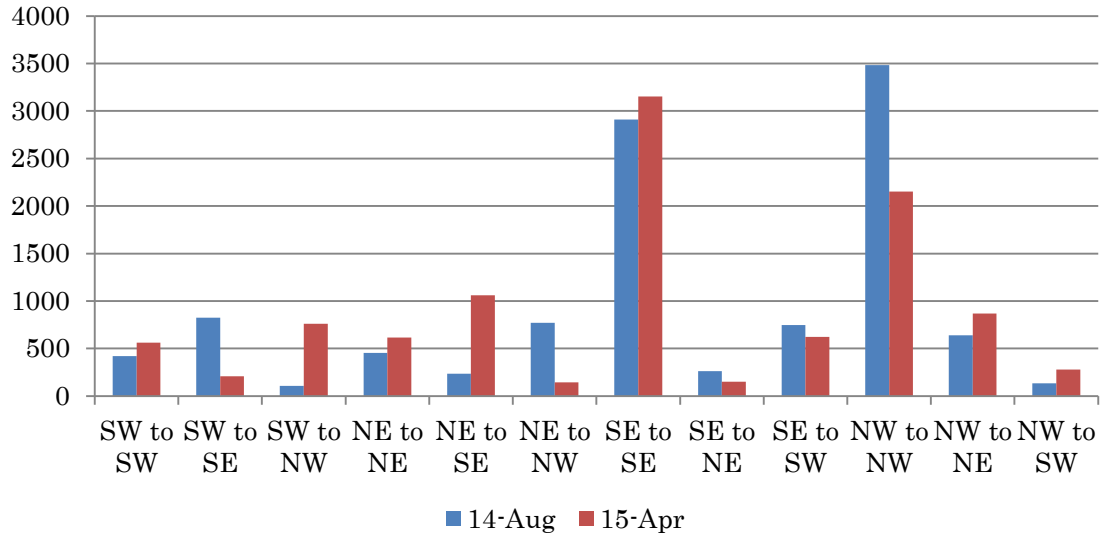
Modal Type	Aug-14				Apr-15			
	Midnight	Morning	Afternoon	Evening	Midnight	Morning	Afternoon	Evening
Motorcycle	193	2742	2627	1440	118	2503	2217	1352
Sedan	23	570	1157	599	64	894	1016	370
Light Truck	14	220	450	212	6	514	556	205
Heavy Truck	12	197	149	101	19	166	156	115
Bus	42	61	68	110	55	38	79	129
Total	**284**	**3790**	**4451**	**2462**	**262**	**4115**	**4024**	**2171**

Source: SEZ Management Committee Consultants

The survey results suggest that modal type share by time of day remains relatively consistent over the period.

Total traffic volume remained relatively consistent over the period. This is consistent with the Class A policy of channeling construction traffic away from Thanlyin Bridge and the populated areas of Thanlyin Town.

Traffic volume by time of day has remained relatively consistent over the time period with a relatively consistent level of traffic volume during the afternoon and morning followed by a drop off in traffic in the evening hours. There is almost no traffic volume in the midnight hours.



Source: SEZ Management Committee Consultants

Figure 13Origin and Destination of Traffic (J-3)

The data show that there is about four times the level of traffic running along the SW/NE Pagoda-Hill-Thilawa Road as compared to the SE/NW Development Road.

4） Survey Point J-4

Survey point J-4 is a 3 way “T” intersection located where the SW/NE axis Dagon-Thilawa Road ends at the SE/NW axis Thilawa Port Road. Proximate to the intersection are a Police Station and the Thilawa Jetty and associated port facilities further to the north. Directly adjacent to the east of the intersection is the Thilawa Power Station facility.

The results of the survey at J-4 are as below.

Table 19 Traffic Volume by Modal Type (J-4)

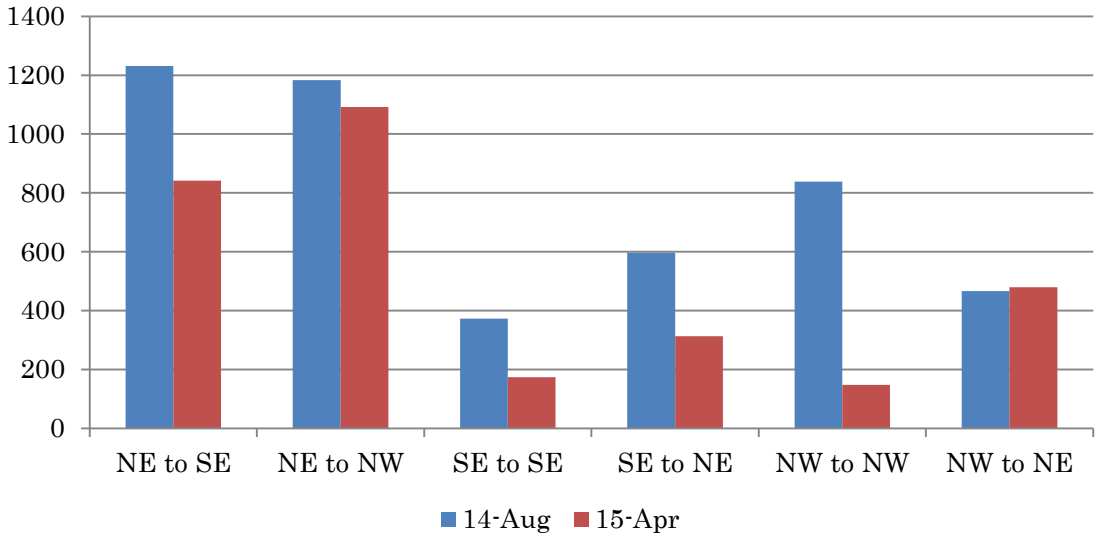
Modal Type	Aug-14				Apr-15			
	Midnight	Morning	Afternoon	Evening	Midnight	Morning	Afternoon	Evening
Motorcycle	33	1799	463	452	96	483	327	231
Sedan	6	564	249	120	20	224	231	89
Light Truck	8	359	122	91	9	177	159	45
Heavy Truck	20	205	36	65	22	307	339	42
Bus	42	375	128	132	86	178	206	125
Total	**109**	**3302**	**998**	**860**	**233**	**1369**	**1262**	**532**

Source: SEZ Management Committee Consultants

The survey results suggest that modal type share by time of day changed significantly over the study period. It is thought that this may be because of increased informal car repair and salvage activity south of the intersection over the study period that effectively blocked the southern route of this intersection after the study began.

Total traffic volume decreased at this intersection during the period significantly although an increase in the number of heavy trucks was observed. It is thought that the decrease in traffic can be attributed to the blockage of the southern route towards the ship breaking yard mentioned in the previous paragraph. The increase in heavy trucks is most likely attributable to the construction activity in the Thilawa SEZ Class A area.

Traffic volume by time of day has decreased significantly in the morning hours and increased slightly in the afternoon hours. Again, the aforementioned reasons of southern route blockage and increase in construction activity are the likely causes of this change.



Source: SEZ Management Committee Consultants

Figure 14Origin and Destination of Traffic (J-4)

There are three routes of ingress/digress from this intersection. The NE route from the Class A area is almost double the traffic volume than the next largest which is from the NW route from around the port and jetty facilities. Again a large decrease in traffic volume was observed over the period.

1.3 Natural Environment

1.3.1 Protected Areas

Currently Myanmar has 39 Protected Areas covering 38,906.49km^2 of land, or 5.75% of Myanmar's land area. Seven of these Protected areas are also ASEAN Heritage Parks and one of the Protected Areas—Moeyungyi Wetland Wildlife Sanctuary—is classified as a Ramsar Site since 2005. There are further proposals for an additional seven Protected Areas that would bring the total number of Protected Areas in Myanmar to 46, or 6.84% of its land area. A map of all Protected Areas in Myanmar is presented in the figure below.

Source: SEZ Management Committee

Figure 15 Map of Myanmar Protected Areas

The nearest Protected Area to the Project is the Hlawga Wildlife Park (#5 in the Figure above) located to the north of Yangon City approximately 45km from the project site by car. Given the distance and proposed transportation routes, the Project is not considered to have an impact on any Protected Area in Myanmar.

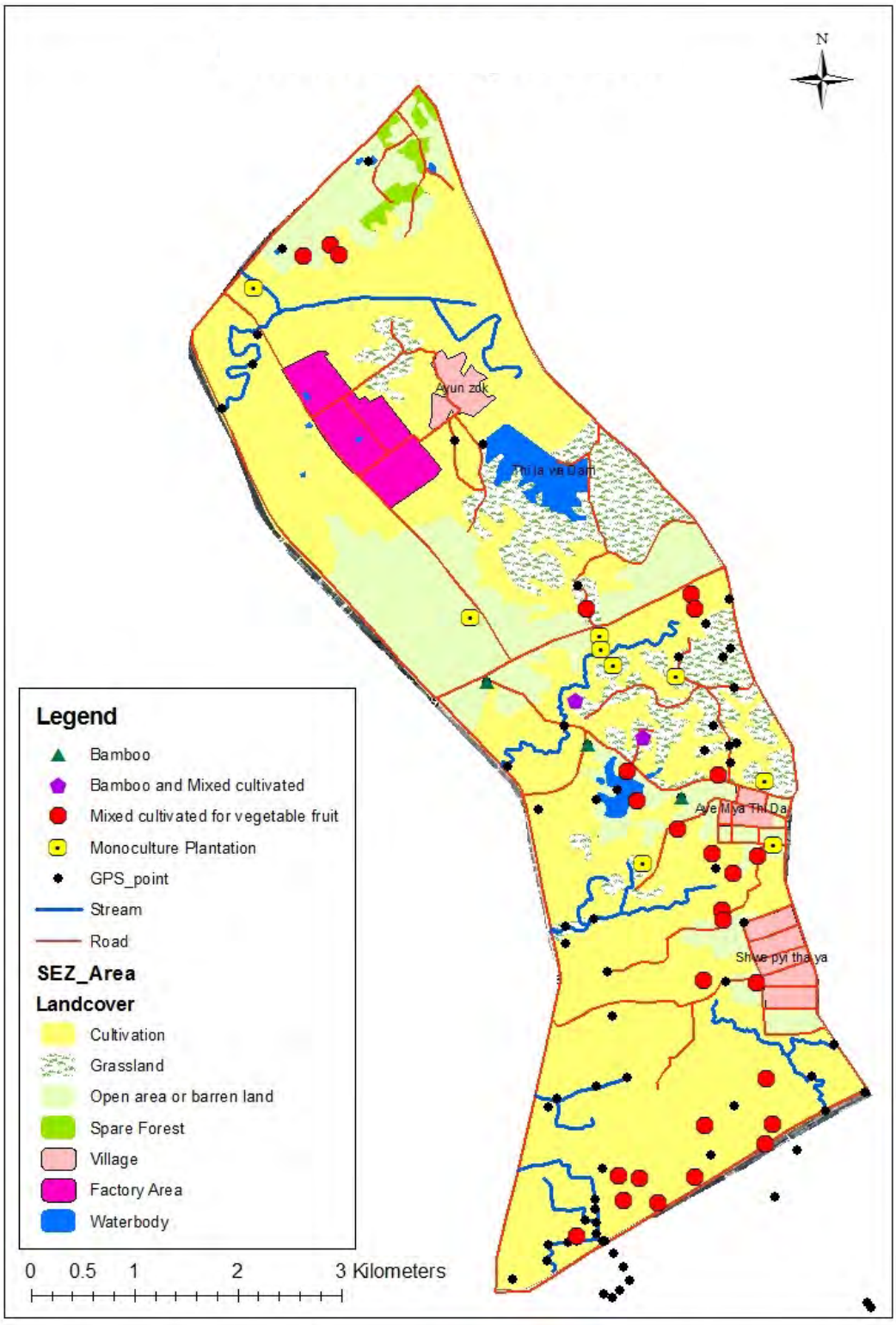
1.3.2 Existing Landcover

The environment in the area is almost entirely converted from the original native forest habitat and heavily converted to human use. It is presently dominated by agricultural use with some mixed industrial use. The table and figure below give an overview of current habitat typology in the area.

Table 20 Existing Habitat Typology

	Land Use Type	Area (km^2)
1	commercial area	0.139
2	cultivated land	12.389
3	education and culture facilities	0.500
4	grass land	5.975
5	industrial area	0.771
6	open space	4.911
7	residential area	1.693
8	swamp area	0.315
9	area under development	1.002
10	water surface	0.752
	Total	**28.447**

Note: The type and data are based on the report of The Project for the Strategic Urban Development Plan of the Greater Yangon modified in association with the satellite image of Thilawa SEZ area.
Source: SEZ Management Committee Consultants



Source: SEZ Management Committee study

Figure 16Landcover Map

1.3.3 Fauna Biodiversity[5]

The apparent fauna on and around the 2,000ha site is of a wide variety. A total of 180 fauna species representing 91 birds (70 species present in cool dry season and 55 species present in rainy season), 31 fishes (16 species present in cool dry season and 27 species present in rainy season), 20 amphibians and reptiles (14 species present in cool dry season and 20 species present in rainy season) and 38 insect species (14 species present in cool dry season and 37 species present in rainy season) were recorded. No endangered species[6] have been identified on site. There was one bird species *Ploceus hypoxanthus* identified on site that is classified as Near Threatened on the IUCN Redlist. There were three fish species, *Labeo nandina*, *Anguilla bicolor,* and *Wallago attu* that are classified as Near Threatened on the IUCN Redlist.

Apart from the IUCN Redlist classification, there are some domestically protected[7] bird species that have been identified within the 2,000ha zone, namely the white-throated babbler (*Turdoides gularis*), which is endemic to Myanmar. Avian wildlife is particularly concentrated in and around water habitats. The mangrove embankments and onsite ponds/lakes provide a habitat for domestically protected birds. Of the 91 unique bird species identified on site, there were 35 bird species were identified in the water and marshland habitat.

Likewise, for aquatic species, the tidal influence on the streams on site and calm waters sheltered by mangrove river embankments may be a relatively important water area in the Yangon River deltaic sub-region that might provide shelter for fish spawning.

A) **Avi-Fauna Species**

A survey was conducted in grassland, marshy, water, and forest habitats in and around the Project area. A total of 91 bird species, representing 70 species, 55 genera, 33 families, and 11 orders were present in the cool dry season and 55 species, 44 genera, 27 families, and 11 orders were present in the rainy season.

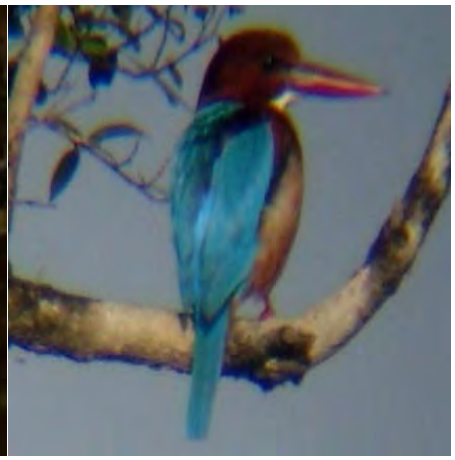
According to the habitat types, 32 species were identified in the paddy field, 58 species in trees, Bushes, and grass land, 4 in the water, and 33 species in marshes and wetlands.

[5] A full account of the biodiversity survey results is provided in the appendix.
[6] Status as determined under the International Union for Conservation of Nature's (IUCN) Red List.
[7] Protected under the Forest Department Notification No. 583/94 (http://www.esabii.org/database/others/documents/Myammer_NoticeNo583_94.pdf)

Merops orientalis

Halcyon pileata

Lanius cristatus



Halcyon smyrnensis

Pycnonotus blanfordi

Prinia inornata

Figure 17Sample Avi-Fauna Identified

Table 21 Avi-fauna Identified on Site

	Order / Family	Scientific Name	Common Name	IUCN Redlist Status
I.	**Anseriformes**			
1	Anatidae	1.*Tadorna ferruginea*	Ruddy Shelduck	LC
		2.*Nettapus coromandelianus*	Cotton Pygmy-goose	LC

	Order / Family	Scientific Name	Common Name	IUCN Redlist Status
2	Dendrocygnidae	3.*Dendrocygna javanica*	Lesser Whistling Duck	LC
II	**Podicipediformes**			
3	Podicipedidae	4.*Tachybaptus ruficollis*	Little Grebe	LC
III	**Gruiformes**			
4	Rallidae	5.*Amaurornis phoenicurus*	White-breasted Waterhen	LC
		6.*Porzana fusca*	Ruddy-breasted Crake	LC
		7.*Gallinula chloropus*	Common Moorhen	LC
5	Jacanidae	8.*Metopidius indicus*	Bronze-winged Jacana	LC
IV	**Charadriiformes**			
6	Scolopacidae	9.*Tringa totanus*	Common Redshank	LC
		10.*T. nebularia*	Common Greenshank	LC
		11.*T. ochropus*	Green Sandpiper	LC
		12.*T. stagnatitis*	Marsh Sandpiper	LC
		13.*Actitis hypoleucos*	Common Sandpiper	LC
7	Charadriidae	14.*Charadrius dubius*	Little Ringed Plover	LC
		15.*Himantopus himantopus*	Black-winged Stilt	LC
8	Laridae	16.*Chlidonias leucopterus*	White-winged Tern	LC
V	**Ciconiiformes**			
9	Ardeidae	17. *Egretta garzetta*	Little Egret	LC
		18.*Mesophoyx intermedia*	Intermediate Egret	LC
		19.*Bubulcus coromandus*	Eastern Cattle Egret	LC
		20.*Ardeola* spp:	Pond Heron	LC
		21.*Butorides striatus*	Little Heron	LC
		22.*Ardeoa bacchus*	Chinese pond Heron	LC
		23.*Ardea purpurea*	Purple Heron	LC
		24.*A alba*	Great Egret	LC
		25.*A cinerea*	Grey Heron	LC
		26.*Nycticorax nycticorax*	Black-crowned Night-Heron	LC
		27.*Ixobrychus flavicollis*	Black Bittern	LC
		28.*I. sinensis*	Yellow Bittern	LC
10	Ciconiidae	29.*Anastomus oscitans*	Asian Openbill	LC
VI	**Pelecaniformes**			
11	Phalacrocoracidae	30.*Phalacrocorax niger*	Little Cormorant	LC
VII	**Strigiformes**			
12	Tytonidae	31.*Tyto longimembris*	Eastern Grass-Owl	LC
VIII	**Falconiformes**			
13	Accipitridae	32.*Milvus migrans*	Black Kite	LC
		33.*Elanus caeruleus*	Black-shoulder Kite	LC
		34.*Accipiter badius*	Shikara	LC
14	Falconidae	35.*Falco tinnunculus*	Common Kestrel	LC
IX	**Coraciiformes**			
15	Coraciidae	36.*Coracias benghalensis*	Indian Roller	LC
16	Megalaimidae	37.*Megalaima haemancephala*	Coppersmith Barbet	LC
17	Meropidae	38.*Merops orientalis*	Little Green Bee-eater	LC
		39.*M. philippinus*	Blue-tailed Bee-eater	LC
18	Alcedinidae	40.*Alcedo atthis*	Common Kingfisher	LC
19	Halcyonidae	41.*Halcyon smyrnensis*	White-throated Kingfisher	LC
		42.*H. pileata*	Black-capped Kingfisher	LC
X	**Cuculiformes**			
20	Cuculidae	43.*Cacomantis merulinus*	Plaintive Cuckoo	LC
21	Centropodidae	44.*Centropus sinensis*	Greater Coucal	LC
XI	**Apodiformes**			
22	Apodidae	45.*Cypsiurus balasiensis*	Asian Palm Swift	LC
23	Hemiprocnidae	46.*Hemiprone coronata*	Crested Treeswift	LC
XII	**Piciformes**			
24	Picidae	47.*Iynx torquilla*	Eurasian Wryneck	LC
XIII	**Passeriformes**			
25	Artamidae	48.*Artamus fuscus*	Ashy woodswallow	LC
26	Aegithinidae	49.*Aegithina tiphia*	Common Iora	LC
27	Rhipiduridae	50.*Rhipidura albicollis*	White-throated Fantail	LC
28	Columbidae	51.*Columba livia*	Rock Pigeon	LC
		52.*Streptopelia chinensis*	Spotted Dove	LC
		53.*S. tranquebarica*	Red-collared Dove	LC
29	Laniidae	54.*Lanius cristatus*	Brown Shrike	LC
30	Covidae	55.*Corvus splendens*	House Crow	LC
		56.*C. macrobrynchos*	Large-billed Crow	LC
		57.*Dicrurus macrocercus*	Black Drongo	LC
		58.*Rhipidura albicollis*	White-throated Fantail	LC

	Order / Family	Scientific Name	Common Name	IUCN Redlist Status
31	Muscicapidae	59.*Copsychus saularis*	Oriental Magpie Robin	LC
		60.*Saxicola maura*	Siberian Stonechat	Not evaluated
		61.*S. caprata*	Pied Bushchat	LC
32	Sturnidae	62.*Acridotheres tristis*	Common Myna	LC
		63.*A. fuscus*	Jungle Myna	LC
		64.*A.burmannicus*	Vinous-breasted Myna	LC
		65.*Gracupica contra*	Asian Pied Starling	LC
		66.*Sturnus malabaricus*	Chestnut-tailed starling	LC
33	Alaudidae	67.*Alauda gulaula*	Oriental Skylark	LC
34	Hirundinidae	68.*Riparia paludicola*	Plain Martin	LC
		69.*Hirundo rustica*	Barn Swallow	LC
35	Pycnonotidae	70.*Pycnonotus cafer*	Red-vented Bulbul	LC
		71.*P. jocosus*	Red-whiskered Bulbul	LC
		72.*P.blafordi*	Streak-eared Bulbul	LC
36	Cisticolidae	73.*Cisticola juncidis*	Zitting Cisticola	LC
		74.*Orthotomus sutorius*	Common tailordbird	LC
37	Sylviidae	75.*Prinia inornata*	Plain Prinia	LC
		76.*P.hodgsonii*	Grey-breasted Prinia	LC
		77.*P. flaviventris*	Yellow-bellied Prinia	LC
		78.*Acrocephalus orientalis*	Oriental Reed Warbler	Not evaluated
		79.*Phylloscopus fuscatus*	Dusky Warbler	LC
38	Tamaliidae	80.*Timalia pileata*	Chestnut-capped Babbler	LC
		81.*Turdoides gularis*	White-throated Babbler	LC
		82.*Chrysomma sinense*	Yellow-eyed Babbler	LC
39	Passeridae	83.*Motacilla alba*	White-wagtail	LC
		84.*M. flava*	Yellow Wagtail	LC
		85.*Passer domesticus*	House Sparrow	LC
		86.*P. montanus*	Eurasian Tree Sparrow	LC
40	Ploceidae	87.*Ploceus philippinus*	Baya Weaver	LC
		88.*P.hypoxanthus*	Asian Golden Weaver	NT
		89.*Lonchua punctulata*	Scaly-breasted Munia	LC
		90.*L. atricapilla*	Chestnut Munia	LC
		91.*L. malacca*	Black-headed Munia	LC

Source: SEZ Management Committee study

Table 22 Prevalence of Avi-Fauna in Dry and Rainy Season

No.	Scientific Name	Cool Dry Season	Rainy Season
1	*Tadorna ferruginea*	4	-
2	*Nettapus coromandelianus*	10	4
3	*Dendrocygna javanica*	1010	18
4	*Tachybaptus ruficollis*	2	-
5	*Amaurornis phoenicurus*	3	-
6	*Porzana fusca*	1	-
7	*Gallinula chloropus*	1	-
8	*Metopidius indicus*	1	-
9	*Tringa totanus*	136	-
10	*T. nebularia*	2	-
11	*T. ochropus*	1	-
12	*T. stagnatitis*	3	-
13	*Actitis hypoleucos*	9	-
14	*Charadrius dubius*	5	-
15	*Himantopus himantopus*	5	-
16	*Chlidonias leucopterus*	1	-
17	*Egretta garzetta*	74	30
18	*Mesophoyx intermedia*	-	4
19	*Bubulcus coromandus*	-	17
20	*Ardeola* spp:	52	6
21	*Butorides striatus*	2	2
22	*Ardeoa bacchus*	-	1
23	*Ardea purpurea*	3	4
24	*A alba*	-	13
25	*A cinerea*	4	-
26	*Nycticorax nycticorax*	-	4
27	*Ixobrychus flavicollis*	-	3
28	*I. sinensis*	1	-
29	*Anastomus oscitans*	4	-
30	*Phalacrocorax niger*	1	30

No.	Scientific Name	Cool Dry Season	Rainy Season
31	*Tyto longimembris*	-	1
32	*Milvus migrans*	64	1
33	*Elanus caeruleus*	-	3
34	*Accipiter badius*	1	-
35	*Falco tinnunculus*	2	-
36	*Coracias benghalensis*	2	-
37	*Megalaima haemancephala*	2	-
38	*Merops orientalis*	11	4
39	*M. philippinus*	1	4
40	*Alcedo atthis*	4	-
41	*Halcyon smyrnensis*	4	4
42	*H. pileata*	3	-
43	*Cacomantis merulinus*	1	1
44	*Centropus sinensis*	3	2
45	*Cypsiurus balasiensis*	57	90
46	*Hemiprone coronata*	7	-
47	*Iynx torquilla*	-	1
48	*Artamus fuscus*	-	1
49	*Aegithina tiphia*	-	2
50	*Rhipidura albicollis*	-	2
51	*Columba livia*	-	13
52	*Streptopelia chinensis*	31	36
53	*S. tranquebarica*	1	-
54	*Lanius cristatus*	33	33
55	*Corvus splendens*	49	179
56	*C. macrobrynchos*	7	-
57	*Dicrurus macrocercus*	75	1
58	*Rhipidura albicollis*	5	2
59	*Copsychus saularis*	5	5
60	*Saxicola maura*	8	-
61	*S. caprata*	17	-
62	*Acridotheres tristis*	7	63
63	*A. fuscus*	22	25
64	*A.burmannicus*	-	7
65	*Gracupica contra*	-	2
66	*Sturnus malabaricus*	-	1
67	*Alauda gulaula*	-	1
68	*Riparia paludicola*	6	-
69	*Hirundo rustica*	86	-
70	*Pycnonotus cafer*	7	4
71	*P. jocosus*	3	4
72	*P.blafordi*	-	2
73	*Cisticola juncidis*	-	6
74	*Orthotomus sutorius*	-	5
75	*Prinia inornata*	31	5
76	*P.hodgsonii*	-	-
77	*P. flaviventris*	2	8
78	*Acrocephalus orientalis*	13	2
79	*Phylloscopus fuscatus*	6	-
80	*Timalia pileata*	5	-
81	*Turdoides gularis*	3	3
82	*Chrysomma sinense*	5	3
83	*Motacilla alba*	3	-
84	*M. flava*	1	-
85	*Passer domesticus*	37	13
86	*P. montanus*	20	32
87	*Ploceus philippinus*	85	6
88	*P.hypoxanthus*	7	8
89	*Lonchua punctulata*	-	7
90	*L. atricapilla*	-	5
91	*L. malacca*	6	-
Total number of individuals		**2083**	**733**
Total number of species		**70**	**55**

Source: SEZ Management Committee study

Table 23 Habitat Utilization by Avi-Fauna Species

	Scientific Name	Different study sites				Total
		P	T/B/G	W	M/W	
1	*Tadorna ferruginea*			✓		1
2	*Nettapus coromandelianus*	✓		✓		2
3	*Dendrocygna javanica*			✓	✓	2
4	*Tachybaptus ruficollis*				✓	1
5	*Amaurornis phoenicurus*				✓	1
6	*Porzana fusca*				✓	1
7	*Gallinula chloropus*				✓	1
8	*Metopidius indicus*				✓	1
9	*Tringa totanus*				✓	1
10	*T. nebularia*				✓	1
11	*T. ochropus*				✓	1
12	*T. stagnatitis*				✓	1
13	*Actitis hypoleucos*				✓	1
14	*Charadrius dubius*				✓	1
15	*Himantopus himantopus*				✓	1
16	*Chlidonias leucopterus*		✓			1
17	*Egretta garzetta*	✓	✓		✓	3
18	*Mesophoyx intermedia*	✓			✓	2
19	*Bubulcus coromandus*	✓	✓		✓	3
20	*Ardeola* spp:		✓		✓	2
21	*Butorides striatus*				✓	1
22	*Ardeoa bacchus*	✓			✓	2
23	*Ardea purpurea*	✓	✓		✓	3
24	*A alba*	✓			✓	2
25	*A cinerea*	✓	✓		✓	3
26	*Nycticorax nycticorax*				✓	1
27	*Ixobrychus flavicollis*			✓	✓	2
28	*I. sinensis*		✓		✓	2
29	*Anastomus oscitans*				✓	1
30	*Phalacrocorax niger*	✓	✓		✓	3
31	*Tyto longimembris*		✓			1*
32	*Milvus migrans*					*
33	*Elanus caeruleus*	✓	✓		✓	3
34	*Accipiter badius*	✓	✓		✓	3
35	*Falco tinnunculus*	✓				1
36	*Coracias benghalensis*		✓			1
37	*Megalaima haemancephala*		✓			1
38	*Merops orientalis*		✓			1
39	*M. philippinus*		✓			1
40	*Alcedo atthis*		✓			1
41	*Halcyon smyrnensis*		✓			1**
42	*H. pileata*		✓			1
43	*Cacomantis merulinus*		✓			1
44	*Centropus sinensis*		✓			1
45	*Cypsiurus balasiensis*					*
46	*Hemiprone coronata*					*
47	*Iynx torquilla*		✓			1
48	*Artamus fuscus*		✓			1
49	*Aegithina tiphia*		✓			1
50	*Rhipidura albicollis*		✓			1
51	*Columba livia*	✓	✓			2**
52	*Streptopelia chinensis*	✓	✓			2**
53	*S. tranquebarica*					**
54	*Lanius cristatus*		✓			1**
55	*Corvus splendens*	✓	✓		✓	3**
56	*C. macrobrynchos*		✓			1

	Scientific Name	Different study sites				Total
		P	T/B/G	W	M/W	
57	*Dicrurus macrocercus*	✓	✓		✓	3
58	*Rhipidura albicollis*		✓			1
59	*Copsychus saularis*		✓			1
60	*Saxicola maura*	✓	✓			2
61	*S. caprata*	✓	✓			2
62	*Acridotheres tristis*	✓	✓			2
63	*A. fuscus*	✓	✓			2
64	*A.burmannicus*		✓			1
65	*Gracupica contra*	✓	✓			2
66	*Sturnus malabaricus*	✓				1
67	*Alauda gulaula*	✓				1
68	*Riparia paludicola*					*
69	*Hirundo rustica*					*/ **
70	*Pycnonotus cafer*		✓			1
71	*P. jocosus*		✓			1
72	*P.blafordi*		✓			1
73	*Cisticola juncidis*	✓	✓			2
74	*Orthotomus sutorius*		✓			1
75	*Prinia inornata*	✓	✓			2**
76	*P.hodgsonii*		✓			1
77	*P. flaviventris*	✓	✓			2
78	*Acrocephalus orientalis*		✓			1
79	*Phylloscopus fuscatus*		✓			1
80	*Timalia pileata*		✓			1
81	*Turdoides gularis*		✓			1
82	*Chrysomma sinense*		✓			1
83	*Motacilla alba*				✓	1
84	*M. flava*				✓	1
85	*Passer domesticus*	✓	✓			2*/**
86	*P. montanus*	✓	✓			2*/**
87	*Ploceus philippinus*	✓	✓			2
88	*P.hypoxanthus*	✓	✓			2
89	*Lonchua punctulata*	✓	✓			2
90	*L. atricapilla*	✓	✓			2
91	*L. malacca*		✓			1
Total number of species		**32**	**58**	**4**	**33**	

P= Paddy field; T/B/G = Tree, Bush and Grassland; W= Water; M = March and Wetland
* Aerial ; ** Cable
Source: SEZ Management Committee study

B) **Fish species**

A survey was conducted along the banks of the creeks inland as well as around the fishing villages on the Yangon River and Hwammun River. Fish fauna were collected from local fishermen fishing in particular streams, creeks, and dam.

A total of 8 orders, 24 families representing 31 fish species in project area were recorded, in which 16 were present during the cool dry season and 27 species were present during the rainy season. Habitat typology included 7 species in brackish water, 13 freshwater species, 11 marine species, 1 catadromous species, and 2 brackish/marine species.

Rainy season is the breeding time for the fish species, brackish and marine fishes usually migrate to the fresh water habitats, especially after the first rain. Water temperature changes stimulate the fish to breed in the cooler water. The temperature must be cool, hence, the

frequency and duration of rainy times, and enough rain fall set the time for breeding season and breeding sites. In Myanmar paddy fields can also be an important breeding ground for fish.

Johnius coitor

Johnius belangerii

Puntius chola

Harpadon nehereus

Anabas testudineus

Figure 18Fish Fauna Identified on Site

Table 24 Fish Species Collected and Identified

No.	Order/Family	Scientific Name	Common Name	Local Name	IUCN Redlist Status
I	**Perciformes**				
1	Sciaenidae	1.*Jonhius belangerii*	Belangeri croaker	Nga poke thin	Not evaluated
		2.*Jonhius coitor*	Coitor croaker	Kyuk nga poke thin	LC
2	Channidae	3.*Channa striatus*	Snake head	Nga yant	LC
		4.*Channa punctatus*	Spotted Snake head	Nga pa naw	Not evaluated
3	Gobidae	5.*Grobius nunus*	Gobi	Ka tha poe	Not

No.	Order/Family	Scientific Name	Common Name	Local Name	IUCN Redlist Status
					evaluated
		6.*Glossogobius giuris*	Gobby	Nga pyat hmwe ni	LC
4	Nandidae	7.*Nandus marnoratus*	Cuvier	Nga wet ma	Not evaluated
5	Cichlidae	8.*Oreochromisniloticus*	Mouth breeder	Tod Tilapia	Not evaluated
6	Terapontidae	9.*Terapon jarbua*	Tiger perch	Nga kyar	LC
II	**Cypriniformes**				
7	Bagridae	10.*Mystus gulio*	Long whiskered	Nga zin yaing	LC
8	Cyprinidae	11.*Labeo nandina*	Carplet	Nga ohon thon	NT
		12.*L. rohita*	Rohu	Nga myit chin	LC
		13.*Puntius chola*	Barbus	Nga khone ma	LC
9	Clariidae	14.*Clarias batracus*	Cat fish	Nga khu	LC
III	**Anguilliformes**				
10	Angullidae	15.*Monopterus albus*	Mud eel	Nga shint	KC
		16.*Anguilla bicolor*	Mud eel	Nga lin ban	NT
11	Muraenesocidae	17.*Congresox talabon*	Conger eel	Thin baw pauk	Not evaluated
12	Mugilidae	18.*Mugil corsula*	Mullet	Ka be luu	LC
IV	**Polynemiformes**				
13	Polynemidae	19.*Polynemus paradiseus*	Threadfiah	Nga pone narr	Not evaluated
14	Anabantidae	20.*Anabas testunidieus*	Clibing perch	Nga pyay ma	Data deficient
15	Centropomidae	21.*Lates calcarifer*	Sea perch	Ka katid	Not evaluated
16	Siluridae	22.*Wallago attu*	Fresh water shark	Nga but	NT
17	Belonidae	23.*Belone cancilia*	Gar fish	Nga phaung yoe	LC
18	Exocoetidae	24.*Exocoetus poecilopterus*	Flying fish	Nga pyan	Not evaluated
19	Clupeidae	25.*Tenualosa ilisha*	Hilsa shed	Nga tha lauk	LC
V	**Scopeliformes**				
20	Synodidae	27.*Harpadon nehereus*	Bombay ducks	Nga hnut	Not evaluated
VI	**Cypriniformes**				
21	Arridae	28.*Arius burmanicus*	Sea catfish	Nga yaung	LC
VII	**Tetraodontiformes**				
22	Tetrodontidae	29.*Tetrodon oblangus*	Globe fish	Nga pu tinn	LC
VIII	**Cypriniformes**				
23	Chacidae	30.*Opiathognathus nigronarginathus*	Jaw fish	Nga kyuk phar	Not evaluated

Source: SEZ Management Committee study

Table 25 Fish Species Collected in Dry and Rainy Season

No.	Scientific Name	Cool Dry Season	Raining Season	Habitat
1	*Jonhius belangerii*	✓	-	MF
2	*Jonhius coitor*	✓	✓	MF
3	*Pangasius pangasius* or *Pangasius myanmar*	-	✓	MF
4	*Channa striatus*	✓	✓	FF
5	*Channa punctatus*	✓	✓	FF
6	*Grobius nunus*	-	✓	BF
7	*Glossogobius giuris*	✓	-	MF
8	*Nandus marnoratus*	✓	✓	MF
9	*Oreochromisniloticus*	✓	✓	FF
10	*Terapon jarbua*	✓	-	FF
11	*Mystus gulio*	✓	✓	BF/FF
12	*Labeo nandina*	-	✓	FF
13	*Labeo rohita*	-	✓	FF
14	*Puntius chola*	✓	✓	FF
15	*Clarias batracus*	✓	✓	FF
16	*Monopterus albus*	-	✓	BF
17	*Anguilla bicolor*	✓	✓	BF
18	*Congresox talabon*	✓	-	BF
19	*Mugil corsula*	✓	✓	MF/BF

No.	Scientific Name	Cool Dry Season	Raining Season	Habitat
20	*Polynemus paradiseus*	✓	✓	MF
21	*Anabas testunidieus*	-	✓	FF
22	*Lates calcarifer*	✓	✓	FF
23	*Wallago attu*	-	✓	FF
24	*Belone cancilia*	-	✓	BF
25	*Exocoetus poecilopterus*	-	✓	FF
26	*Tenualosa ilisha*	-	✓	BF/MF
27	*Harpadon nehereus*	-	✓	MF
28	*Arius burmanicus*	-	✓	MF
29	*Tetrodon oblangus*	-	✓	MF
30	*Opiathognathus nigronarginathus*	-	✓	MF
Total number of species		**16**	**26**	

MF=Marine Fish, FF= Fresh water Fish, BF= Brakish water Fish
Source: SEZ Management Committee study

C) **Reptile and Amphibian species**

A total of 19 species comprising 9 families and 3 orders of amphibian and reptiles were observed in the Project Area surveyed during dry cool and rainy season. In the cool dry season, there are 13 species under 11 genera and 8 families. In the rainy season, there are 19 species under 16 genera and 9 families. No species above the IUCN classification of Least Concern were identified. All species recorded are small and are adapted to habitation in microhabitats; their feeding types are mostly insect eaters.

Bronchocela cristatella

Calotes htunwini

Calotes mystaceus

Gekko gecko

Mabuya mulifasciata

Hemidactylus sp.

Amphiesma stolta

Rana macrodactyla

Kaoula pulchara

Polypedates leucomystax

Rana limnocharis

Figure 19Selected Reptiles and Amphibians Identified on Site

Table 26 Amphibian and Reptile Species Identified in Dry and Rainy Seasons

No.	Scientific Name	Scientific Name		Habitat Type	Total No.	IUCN Redlist Status
		Cool dry season	Rainy season			
1	*Calotes versicolar*	✓	✓	Tree	3	Not evaluated
2	*Calotes mystaceous*	✓	✓	Tree	3	Not evaluated

3	*Bronchocela cristatella*	-	✓	Bush	1	Not evaluated
4	*Calotes htunwini*	-	✓	Tree	2	Not evaluated
5	*Hemidactylus frenatus*	✓	✓	Building Wall	2	LC
6	*Gekko gecko*	-	✓	Building	3	Not evaluated
7	*Mabuya multifasciatus*	✓	✓	Roadside	3	Not evaluated
8	*Ptyas mucosus*	✓	✓	Pond	1	Not evaluated
9	*Xenochropis piscata*	✓	✓	Creek	1	Not evaluated
10	*Enhydris enhydris*	✓	✓	Pond	1	LC
11	*Homalopsis buccata*	-	✓	-	2	LC
12	*Amphiasma stolata*	✓	✓	Bush	1	LC
13	*Naja kaouthia*	✓	✓	-	1	LC
14	*Bufo melanostictus*	✓	✓	Near the pond	3	LC
15	*Rana tigerina*	✓	✓	Grass	1	LC
16	*Rana limnocharis*	✓	✓	Bush	2	LC
17	*Rana macrodactylus*	-	✓	Tree	4	Not evaluated
18	*Polypidates lucomystax*	-	✓	Grass	2	LC
19	*Kaoula pulchara*	✓	✓	Near the pond	3	LC
Total numbers of species		**13**	**19**		**39**	

Source: SEZ Management Committee study

D) **Insect species**

Insect species in terms of pure species number and population size, insects are by far the largest category and are a fundamental to most ecosystems. A total of 37 species in 11 families were observed, including 3 orders of butterflies, dragonflies and damselflies, beetles were observed from Thilawa Project Area during dry cool and rainy season. In the dry cool season, there are 14 species under 11 genera, and 5 families. In the rainy season, there are 37 species under 28 genera and 10 families. Recorded diversity is low as it is converted agricultural land without habitat diversity.

Captosilia pyranthe pyranthe

Arhopala aeeta de

Junonia altites

Junonia almana almana

Neurothemis tullia tullia

Brachythemis contaminata

Diplacodes nebulosa

Diplacodes trivialis

Orthetrum sabina.

Sympetrum fonscolombei

Pantala flavescens

Ceriagrion nigroflavum

Figure 20 Selected Insect Species Identified on Site

Table 27 Insect Species Identified

Order	Family	Scientific Name	IUCN Redlist Status
I. Lepidoptera	1. Pieridae	1. *Captopsilia pyranthe pyranthe*	Not evaluated
		2. *Eurema blanda silhetana*	Not evaluated
	2. Danaidae	3. *Danaus limniace limniace*	Not evaluated
		4. *Danaus melanippus hegesippus*	Not evaluated
	3. Nymphalidae	5. *Pseudergolis wedah wedah*	Not evaluated
		6. *Jononia hierta*	LC
		7. *J. almana almana*	LC
		8. *J. atlites*	Not evaluated
		9. *Cupha erymanthis lotis*	Not evaluated
		10. *Hypolimnas anomala anomala*	Not evaluated
	4. Lycaenidae	11. *Arhopala aeeta de*	Not evaluated
II. Odonata	5. Libellulidae	12. *Orthetrum sabina*	LC

Order	Family	Scientific Name	IUCN Redlist Status
		13. *Neurothemis intermedia atalanta*	LC
		14. *Neurothemis tullia tullia*	LC
		15. *Neurothemis inquirendae*	-
		16. *Rhodothemis rufa*	LC
		17. *Brachythemis contaminata*	LC
		18. *Diplacodes nebulosa*	LC
		19. *Diplacodes trivialis*	LC
		20. *Sympetrum fonscolombei*	LC
		21. *Pantala flavescens*	LC
		22. *Trithemis kirbyi kirbyi*	LC
	6. Coenagriidae	23. *Ceriagrion fallax*	LC
		24. *Ceriagrion nigroflavum*	Data deficient
		25. *Coenagrion* sp.	-
		26. *Ischnura senegalensis*	LC
		27. *Crocothemis servilia*	LC
III. Coleoptera	7. Coccinelidae	28. *Coccinella transversalis*	Not evaluated
	8. Chrysomelidae	30. *Aulacophora foveicollis*	Not evaluated
		31. *Aulacophora lewisii*	Not evaluated
		32. *Aspidomorpha miliaris*	Not evaluated
		33. *Sagra* sp.	-
		34. *Lilioceris* sp.	-
		35. *Cassida circumdata*	Not evaluated
		36. *Taiwania citcumdata*	Not evaluated
	9. Canthridae	37. *Cantharis* sp.	-
	10. Buprestidae	38. *Sternocera aequisignata*	Not evaluated

Source: SEZ Management Committee study

Table 28 Insect Species Identified in Dry and Rainy Seasons

No.	Scientific Name	Cool dry season	Rainy Season
1	*Captopsilia pyranthe pyranthe*	✓	✓
2	*Eurema blanda silhetana*	-	✓
3	*Danaus limniace limniace*	-	✓
4	*Danaus melanippus hegesippus*	-	✓
5	*Pseudergolis wedah wedah*	-	✓
6	*Jononia hierta*	-	✓
7	*J. almana almana*	✓	✓
8	*J. atlites*	✓	✓
9	*Cupha erymanthis lotis*	-	✓
10	*Hypolimnas anomala anomala*	-	✓
11	*Arhopala aeeta de*	✓	-
12	*Orthetrum sabina*	✓	✓
13	*Neurothemis intermedia atalanta*	-	✓
14	*Neurothemis tullia tullia*	✓	✓
15	*Neurothemis inquirendae*	-	✓
16	*Rhodothemis rufa*	-	✓
17	*Brachythemis contaminata*	✓	✓
18	*Diplacodes nebulosa*	✓	✓
19	*Diplacodes trivialis*	✓	✓
20	*Sympetrum fonscolombei*	✓	✓
21	*Pantala flavescens*	✓	✓
22	*Trithemis kirbyi kirbyi*	-	✓
23	*Ceriagrion fallax*	✓	✓
24	*Ceriagrion nigroflavum*	✓	✓
25	*Coenagrion* sp.	-	✓
26	*Ischnura senegalensis*	✓	✓
27	*Crocothemis servilia*	-	✓
28	*Coccinella transversalis*	-	✓
29	*Coccinella transversalis*	-	✓
30	*Aulacophora foveicollis*	-	✓
31	*Aulacophora lewisii*	-	✓
32	*Aspidomorpha miliaris*	-	✓
33	*Sagra* sp.	-	✓
34	*Lilioceris* sp.	-	✓

No.	Scientific Name	Cool dry season	Rainy Season
35	*Cassida circumdata*	-	✓
36	*Taiwania citcumdata*	-	✓
37	*Cantharis* sp.	-	✓
38	*Sternocera aequisignata*	-	✓
Total number of species		**14**	**37**

Source: SEZ Management Committee study

1.3.4 Flora Biodiversity

A) Methodology

The floristic data and ecological data collection was conducted in both the cool dry season and the rainy season in the Thilawa SEZ Area . As the environment is continuous across the borders of the Project area, areas both inside and outside of the Project area zone were surveyed. Outside the project zone is referred to as indirect area while the inside of the project zone area is referred to as the direct area. Global Positioning System (GPS) was used to navigate and mark the coordinates of the sample plots.

In order to obtain data to predict tree species composition in the forest and vegetation types, 30x30 meter quadrants were set up and tree species in the plot were identified and population of each species were also counted. Permanent sample plots were made for easy accessibility in both sample seasons. The species identification was carried out by using a key to flowering plants families and appropriate literature while being confirmed by matching with herbarium specimens of Department of Botany, University of Yangon.

To get representative checklists of the mangrove species, plant collection was also carried out by random transect lines along creek and the river bank in the patches of mangrove wherever possible. Specimen collection was made within 10 and 20 meter on either sides of the transect lines. Mangrove vegetation was surveyed at direct impact zones and indirect impact zones according to the method of Whittaker plots (Stohlgren et. al. 1995), for assessing types of vegetation.

A profile pro-forma is used in the sections below to sketch a cross section of the vegetation along the bio-hotspot mangrove area of the construction sites but site's representative plot may be common one and types of species composition in each and every site are same. From the edge of the lowest tide water to the place where maximum reach of the mangrove species. Transect lines were conducted along the area. Sketching profile enables the structure and stem distribution to be visualized, and different canopy level.

In every sites, GPS locations were recorded and 100m transect lines were made along the stream in direct and indirect zones, according to the maximum reach of mangrove vegetation. Each and every plant was recorded; stamped and all stem of multi-stemmed trees were also measured. Heights of the plants were estimated by measuring the height of

human who standing under sample tree.

Mangroves were found in limited areas such as the bank of the creeks and near river only. So the creeks were surveyed by boat at high tide and low tide times and measured the plants on their bank. The profiles of the creeks were sketched 30m crossing including wide of the creeks and until maximum reach of the mangrove and its associate growing. Photographs were taken on each transect and for each species composition.

1) Population of Individual Species (per hectare)

The population of species will show not only the composition of species but also the richness of the species in the study area. According to R.He'dl, M Sva'tek, M. Dancak, Rodzay A.W., M. Salleh A.B., Kamariah A.S.(2009), population of individual species (per hectare) is determined by following formula.

$$Pop\ of\ individual\ species\ = \frac{Total\ Individual\ species}{Total\ Plots\ Area\ (m^2)} \times 10{,}000m^2$$

2) Relative Density of Tree species

The density of a species refers to the numerical representation of its individual and the availability of space in a unit area. The density index shows not only the richness of the taxa but also the relative distribution of the individuals. According to Curtis (1959), the density index is determined by the following formula.

$$Relative\ density\ of\ tree\ species\ = \frac{No\ of\ individual\ species}{Total\ no.of\ all\ individual\ species} \times 100$$

3) Relative frequency of Tree species

The relative frequency of a species refers to the percentage occurrence of its individuals and shows the frequency of different species growing in the study area. The species which fall in high frequency class can be considered as the most common species in the study area. According to Curtis (1959), the relative frequency is determined by the following formula.

$$Relative\ frequency\ of\ tree\ species\ = \frac{Sample\ plots\ with\ Species}{Total\ no.of\ all\ species} \times 100$$

According to Raunkiaer's Law of frequency (1934), each species was grouped into one of five frequency class (FC) quintiles with 1-20% being the rarest and 80-100% being the most dominant. This frequency class also indicates the homogeneity or heterogeneity of the floristic distribution in the study area.

4） Population of tree species by girth at breast height (GBH) class interval

Tree species in GBH class interval is calculated, where:

$$Population\ of\ GBH\ class\ interval\ = \frac{No\ of\ specimens\ at\ GBH\ class\ interval}{Total\ no.of\ all\ specimens} \times 100$$

A low GBH class interval indicates a degraded and secondary forest height. A high GBH class interval indicates primary forest.

5） Tree species in Height class interval

Tree species in Height class interval is calculated, where:

$$Population\ of\ height\ class\ interval\ = \frac{No\ of\ specimens\ at\ height\ interval}{Total\ no.of\ all\ specimens} \times 100$$

Low height class interval indicates a degraded and secondary forest and high height class interval indicates a primary forest.

B) Overview of Flora

The flora in the project area belongs to Asia tropical coastal tidal region. According to WWF Eco-regions (Figure 1-42 below), the study area is situated in the Myanmar coastal mangroves and Myanmar coastal rain forest. Mangrove species grow only in the brackish or salty water and are sensitive to the changes of ecosystem. Since at least colonial times, forest lands in the Project area have been converted to agriculture land and other development activities. The mangroves lining the banks of the rivers and creeks are subject to severe degradation because there is no clear-cut land-use system in the past and mangrove resources have most likely been used in an informal way over the past. Mangroves today are found only in small patches along the creek and river banks.

Today, dominant mangrove species are *Sonneratia caseolaris (L.) Engl., Avicennia spp., Sonneratia apetala Buch.-Ham.,* and *Excoecaria agallocha L.*, which are Irrawaddy Mangroves according to WWF. These species are growing wild in patches along the bank of Yangon River and the creeks which drain into it. Only 9 mangrove species (7 species in direct impact zone and 9 species in indirect impact zone) and 27 mangrove associate species are extant in summer with 4 additional mangroves associate species extant in the rainy season are growing in patches along the bank of creeks and Yangon River.

There were two IUCN Redlist endangered or near threatened species found in the area, *Dalbergia cultrate* Grah. and *Dipterocarpus alatus* Roxb. They do not occur naturally here

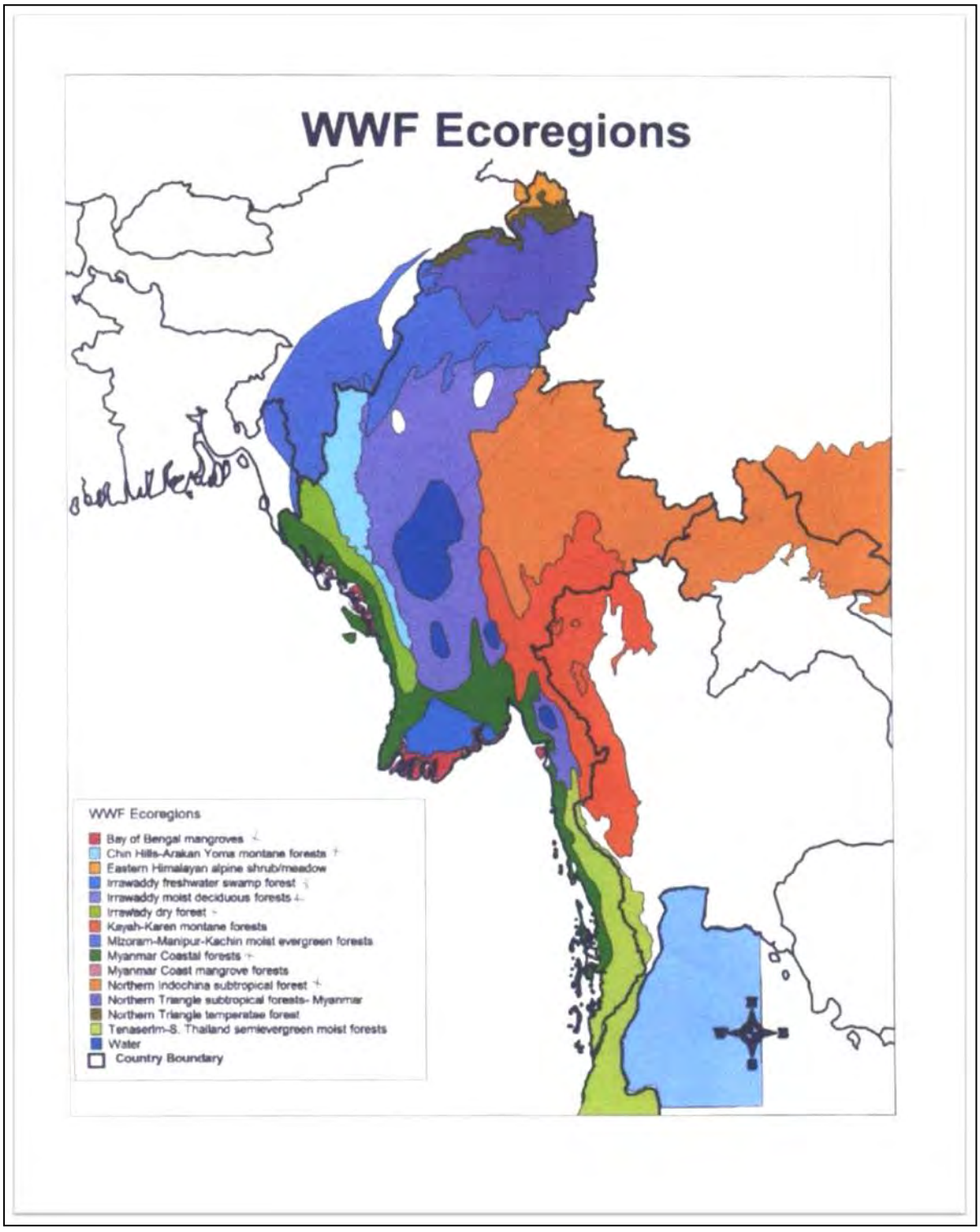
and are both cultivated *ex situ* at monasteries or village homesteads. The location of the *Dipterocarpus alatus* Roxb. specimen may be within the project area itself nearby Phalan village. Steps should be taken to avoid the destruction of this specimen.

Table 29 Endangered or Near Threatened Flora Species

	Scientific Name	Family Name	Vernacular Name	IUCN criteria	Place	Location
1	*Dalbergia cultrata* Grah.*	Fabaceae	Yin-daik	NT	Moekyoswum Monastery	N16° 40' 24.8" E96° 16' 30.9"
2	*Dipterocarpus alatus* Roxb.	Dipterocarpaceae	Kanyin-phyu	EN A1 cd +2cd, B1 +2c	Phalan old village near Thidarmyaing	N16° 38' 20.2" E96° 17' 26.7"

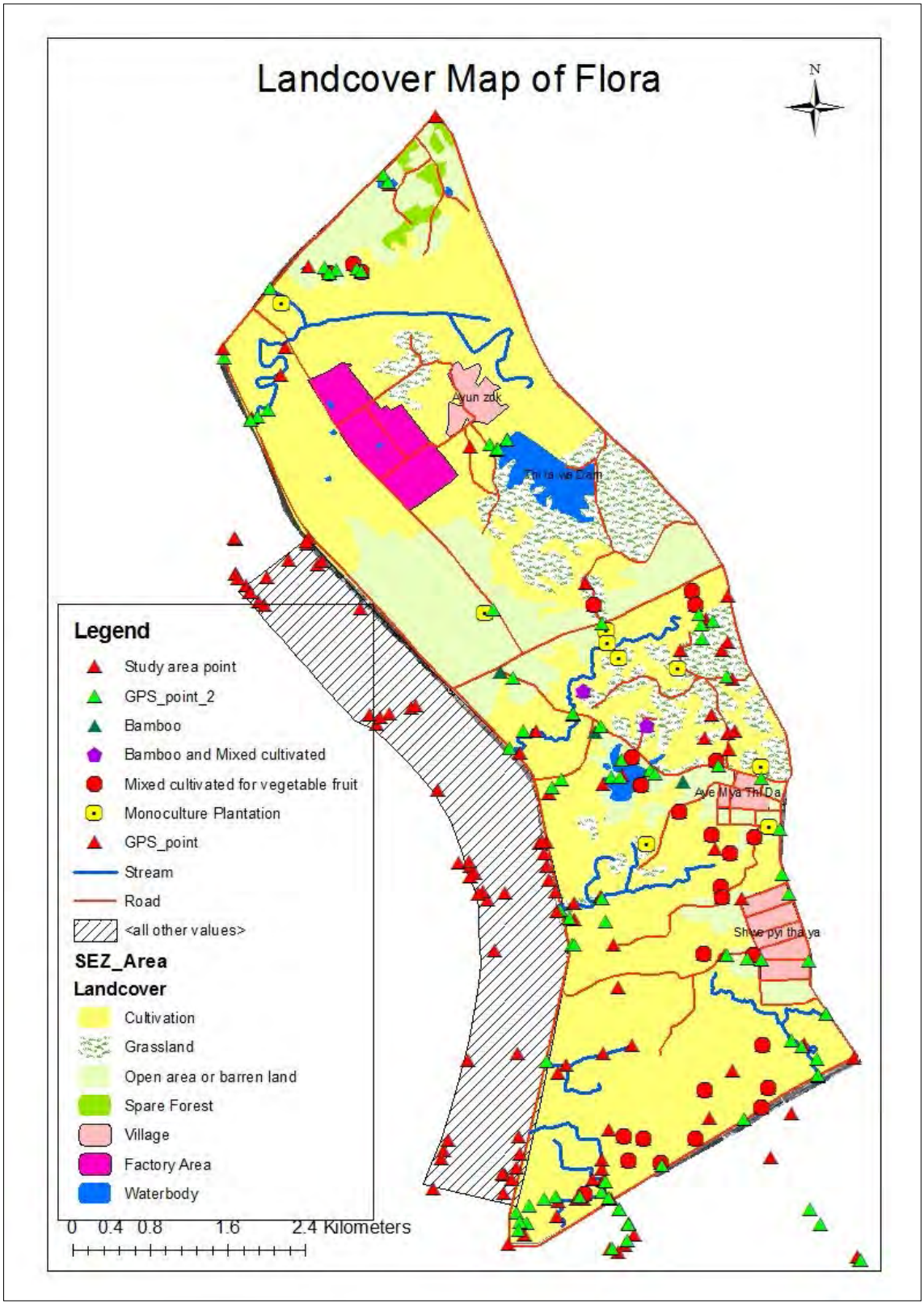
**Dalbergia cultrata* Grah. is listed in the World List of Threatened Trees as Endangered (A1cd).

Source: SEZ Management Committee study



Source: World Wildlife Fund

Figure 21WWF Ecoregions of Myanmar



Source: SEZ Management Committee study

Figure 22Area of Study and Landcover

As indicated in the landcover map (Figure 1-22) above, almost all of the terrestrial

ecosystem in the Project area is covered by agriculture lands. There are also monoculture plantations of *Acacia auriculiformis* A.Cunn., and some bamboo patches as well as a mixed plantation of fruit trees like *Anacardium occidentale* L., found in large patches in the studied area. Ornamental flower cultivation in private orchards is also common in the Project area.

C) Terrestrial Ecosystem

1) Tree Species in Direct Impact Zone





Note: bottom two photos are *Dipterocarpus alatus Roxb.*, (Endangered Species)

Figure 23Mixed Cultivated for Vegetable Fruit (Direct Zone)

The total number of tree species in 24 representative sample plots is 71 species belonging to 64 genera. The dominant tree species is the cultivated species *Acacia auriculiformis A.Cunn.*, (Ma-lay-sia-padauk) followed by *Microcos tomentosa J.E.Smith.,* (Mya-ya), *Anacardium occidentale L.*, (Thi-ho) and *Lannea coromandelica* (Houtt.) Merrr., (Na-be).

Table 30 Tree Species Population (Direct Zone)

	Scientific Name	No. of individual	Total no. of individual/ha	Total no. of population/ha (%)
1	*Acacia auriculiformis* A.Cunn.	*11,369*	*449.13*	*70.90*
2	*Acacia concinna* DC.	*1*	*0.04*	*0.01*
3	*Albizia lebbek* (L.) Benth.	*3*	*0.12*	*0.02*
4	*Anacardium occidentale* L.	*551*	*21.77*	*3.44*
5	*Antidesma* sp.	*21*	*0.83*	*0.13*
6	*Archidendron jiringa* (Jack) Nielsen	*1*	*0.04*	*0.01*
7	*Artocarpus heterophyllus* Lam.	*29*	*1.15*	*0.18*
8	*Azadirachta indica* A.Juss.	*8*	*0.32*	*0.05*
9	*Barringtonia acutangula* Kurz.	*1*	*0.04*	*0.01*
10	*Borassus flabellifer* L.	*12*	*0.47*	*0.07*
11	*Carallia brachiata* (Lour.) Merr	*63*	*2.49*	*0.39*
12	*Careya arborea* Roxb.	*13*	*0.51*	*0.08*
13	*Carica papaya* L.	*3*	*0.12*	*0.02*
14	*Casuarina equisetifolia* Forst.	*4*	*0.16*	*0.02*
15	*Ceiba pentandra* Gaertn.	*33*	*1.30*	*0.21*
16	*Chaetocarpus castanocarpus* Thwaites	*13*	*0.51*	*0.08*
17	*Citharexylum suberratum* Sw.	*1*	*0.04*	*0.01*
18	*Citrus aurantiifolia* (Christm.) Sw.	*2*	*0.08*	*0.01*
19	*Citrus medica* L.	*3*	*0.12*	*0.02*
20	*Cocos nucifera* L.	*18*	*0.71*	*0.11*
21	*Couroupita guianensis*	*1*	*0.04*	*0.01*
22	*Crateva adansonii* DC.	*7*	*0.28*	*0.04*
23	*Delonix regia* (Bojer ex Hook) Rafin.	*4*	*0.16*	*0.02*
24	*Dendrocalamus calostachyus* (Kurz) Kurz	*1*	*0.04*	*0.01*
25	*Dendrocalamus longispathus* (Kurz)Kurz	*44*	*1.74*	*0.27*
26	*Diospyros* sp.	*5*	*0.20*	*0.03*
27	*Dipterocarpus alatus*	*1*	*0.04*	*0.01*
28	*Erythrina crista-galli*	*10*	*0.40*	*0.06*
29	*Eucalyptus ovata* Labill.	*56*	*2.21*	*0.35*
30	*Ficus altissima* Blume	*3*	*0.12*	*0.02*
31	*Ficus hispida* L.	*1*	*0.04*	*0.01*
32	*Ficus lacor* Buch.-Ham.	*1*	*0.04*	*0.01*
33	*Ficus religiosa* L.	*12*	*0.47*	*0.07*
34	*Fluggea leucopyrus* Willd	*1*	*0.04*	*0.01*
35	*Garcinia heterandra* Wall.	*20*	*0.79*	*0.12*
36	*Getonia floribunda* Roxb.	*1*	*0.04*	*0.01*
37	*Gigantochloa nigrociliata* (Buse) Kurz	*48*	*1.90*	*0.30*
38	*Heterophragma adenophyllum* (Willd.) Seem. ex Benth.& Hook.	*100*	*3.95*	*0.62*
39	*Lagerstroemia speciosa* (L.) Pers.	*18*	*0.71*	*0.11*
40	*Lannea coromandelica* (Houtt.) Merrr.	*537*	*21.21*	*3.35*
41	*Mangifera indica* L.	*240*	*9.48*	*1.50*
42	*Markhamia stipulata* (Wall.) Seem.ex K.Schum.	*20*	*0.79*	*0.12*
43	*Microcos tomentosa* J.E.Smith	*1,361*	*53.77*	*8.49*
44	*Mimusops elengi* L.	*2*	*0.08*	*0.01*
45	*Moringa pterygosperma* Gaertn.	*23*	*0.91*	*0.14*
46	*Oroxylum indicum* (L.) Kurz.	*8*	*0.32*	*0.05*
47	*Oxytenanthera albociliata* Munro	*35*	*1.38*	*0.22*
48	*Phyllanthus emblica* L.	*1*	*0.04*	*0.01*
49	*Pithecellobium dulce* (Roxb.) Benth.	*94*	*3.71*	*0.59*
50	*Plumeria obtusa*	*1*	*0.04*	*0.01*

	Scientific Name	No. of individual	Total no. of individual/ha	Total no. of population/ha (%)
51	*Polyalthia longifolia* (Lam.)Benth. & Hook.f.	*1*	*0.04*	*0.01*
52	*Psidium guajava* L.	*34*	*1.34*	*0.21*
53	*Pterocarpus macrocarpus* Kurz	*5*	*0.20*	*0.03*
54	*Pterospermum semisagittatum* Buch.-Ham.	*4*	*0.16*	*0.02*
55	*Randia erythroclada* Kurz.	*500*	*19.75*	*3.12*
56	*Samanea saman* (Jacq.) Merr.	*31*	*1.22*	*0.19*
57	*Sandoricum koetjape* (Burm.f.) Merr.	*1*	*0.04*	*0.01*
58	*Schleichera oleosa* (Lour.) Oken	*5*	*0.20*	*0.03*
59	*Senna siamea* (Lam.) Irwin & Barneby	*1*	*0.04*	*0.01*
60	*Sesbania grandiflora* (L.) Poir.	*19*	*0.75*	*0.12*
61	*Simarouba glauca* DC.	*25*	*0.99*	*0.16*
62	*Spondias pinnata* (L.)Kurz.	*4*	*0.16*	*0.02*
63	*Streblus asper* Lour.	*22*	*0.87*	*0.14*
64	*Syzygium grande* (Wight) Walp	*495*	*19.56*	*3.09*
65	*Tamarindus indica* L.	*9*	*0.36*	*0.06*
66	*Tectona grandis* L. f.	*2*	*0.08*	*0.01*
67	*Terminalia bellirica* (Gaertn) Roxb.	*15*	*0.59*	*0.09*
68	*Terminalia catappa* L.	*3*	*0.12*	*0.02*
69	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	*9*	*0.36*	*0.06*
70	*Uvaria cordata* Schum. & Thonn.	*20*	*0.79*	*0.12*
71	*Zizyphus jujuba* Lam.	*26*	*1.03*	*0.16*
	Total	**16,036**	**633.50**	**100.00**

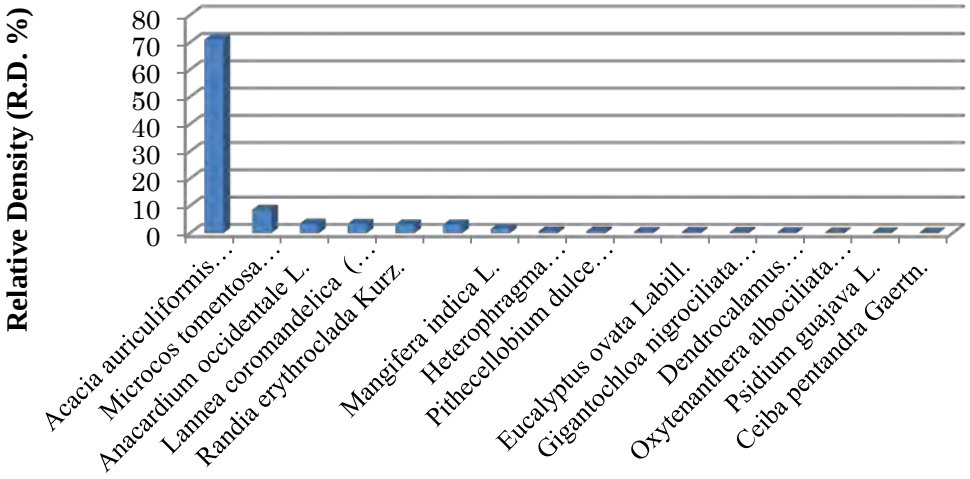
Source: SEZ Management Committee study

Among the sample plots species density per hectare varied and the highest density was observed *Acacia auriculiformis A.Cunn.*, followed by *Microcos tomentosa J.E.Smith.*,. This shows that these two species are abundant in this area.

Table 31 Tree Density (Direct Zone)

	Scientific Name	Density (D)	Relative Density (R.D. %)
1	*Acacia auriculiformis* A.Cunn.	473.71	70.90
2	*Microcos tomentosa* J.E.Smith	56.71	8.49
3	*Anacardium occidentale* L.	22.96	3.44
4	*Lannea coromandelica* (Houtt.) Merrr.	22.38	3.35
5	*Randia erythroclada* Kurz.	20.83	3.12
6	*Syzygium grande* (Wight) Walp	20.63	3.09
7	*Mangifera indica* L.	10.00	1.50
8	*Heterophragma adenophyllum* (Willd.)Seem. ex Benth.& Hook.	4.17	0.62
9	*Pithecellobium dulce* (Roxb.) Benth.	3.92	0.59
10	*Carallia brachiata* (Lour.) Merr	2.63	0.39
11	*Eucalyptus ovata* Labill.	2.33	0.35
12	*Gigantochloa nigrociliata* (Buse) Kurz	2.00	0.30
13	*Dendrocalamus longispathus* (Kurz)Kurz	1.83	0.27
14	*Oxytenanthera albociliata* Munro	1.46	0.22
15	*Psidium guajava* L.	1.42	0.21
16	*Ceiba pentandra* Gaertn.	1.38	0.21
17	*Samanea saman* (Jacq.) Merr.	1.29	0.19
18	*Artocarpus heterophyllus* Lam.	1.21	0.18
19	*Zizyphus jujuba* Lam.	1.08	0.16
20	*Simarouba glauca* DC.	1.04	0.16
21	*Moringa pterygosperma* Gaertn.	0.96	0.14
22	*Streblus asper* Lour.	0.92	0.14
23	*Antidesma* sp.	0.88	0.13
24	*Garcinia heterandra* Wall.	0.83	0.12
25	*Markhamia stipulata* (Wall.) Seem.ex K.Schum.	0.83	0.12
26	*Uvaria cordata* Schum. & Thonn.	0.83	0.12
27	*Sesbania grandiflora* (L.) Poir.	0.79	0.12
28	*Cocos nucifera* L.	0.75	0.11
29	*Lagerstroemia speciosa* (L.) Pers.	0.75	0.11
30	*Terminalia bellirica* (Gaertn) Roxb.	0.63	0.09

	Scientific Name	Density (D)	Relative Density (R.D. %)
31	*Careya arborea* Roxb.	0.54	0.08
32	*Chaetocarpus castanocarpus* Thwaites	0.54	0.08
33	*Borassus flabellifer* L.	0.50	0.07
34	*Ficus religiosa* L.	0.50	0.07
35	*Erythrina crista-galli*	0.42	0.06
36	*Tamarindus indica* L.	0.38	0.06
37	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	0.38	0.06
38	*Azadirachta indica* A.Juss.	0.33	0.05
39	*Oroxylum indicum* (L.) Kurz.	0.33	0.05
40	*Crateva adansonii* DC.	0.29	0.04
41	*Diospyros* sp.	0.21	0.03
42	*Pterocarpus macrocarpus* Kurz	0.21	0.03
43	*Schleichera oleosa* (Lour.) Oken	0.21	0.03
44	*Casuarina equisetifolia* Forst.	0.17	0.02
45	*Delonix regia* (Bojer ex Hook) Rafin.	0.17	0.02
46	*Pterospermum semisagittatum* Buch.-Ham.	0.17	0.02
47	*Spondias pinnata* (L.)Kurz.	0.17	0.02
48	*Albizia lebbek* (L.) Benth.	0.13	0.02
49	*Carica papaya* L.	0.13	0.02
50	*Citrus medica* L.	0.13	0.02
51	*Ficus altissima* Blume	0.13	0.02
52	*Terminalia catappa* L.	0.13	0.02
53	*Citrus aurantiifolia* (Christm.) Sw.	0.08	0.01
54	*Mimusops elengi* L.	0.08	0.01
55	*Tectona grandis* L. f.	0.08	0.01
56	*Acacia concinna* DC.	0.04	0.01
57	*Archidendron jiringa* (Jack) Nielsen	0.04	0.01
58	*Barringtonia acutangula* Kurz.	0.04	0.01
59	*Citharexylum suberratum* Sw.	0.04	0.01
60	*Couroupita guianensis*	0.04	0.01
61	*Dendrocalamus calostachyus* (Kurz) Kurz	0.04	0.01
62	*Dipterocarpus alatus*	0.04	0.01
63	*Ficus hispida* L.	0.04	0.01
64	*Ficus lacor* Buch.-Ham.	0.04	0.01
65	*Fluggea leucopyrus* Willd	0.04	0.01
66	*Getonia floribunda* Roxb.	0.04	0.01
67	*Phyllanthus emblica* L.	0.04	0.01
68	*Plumeria obtusa*	0.04	0.01
69	*Polyalthia longifolia* (Lam.)Benth. & Hook.f.	0.04	0.01
70	*Sandoricum koetjape* (Burm.f.) Merr.	0.04	0.01
71	*Senna siamea* (Lam.) Irwin & Barneby	0.04	0.01



Source: SEZ Management Committee study

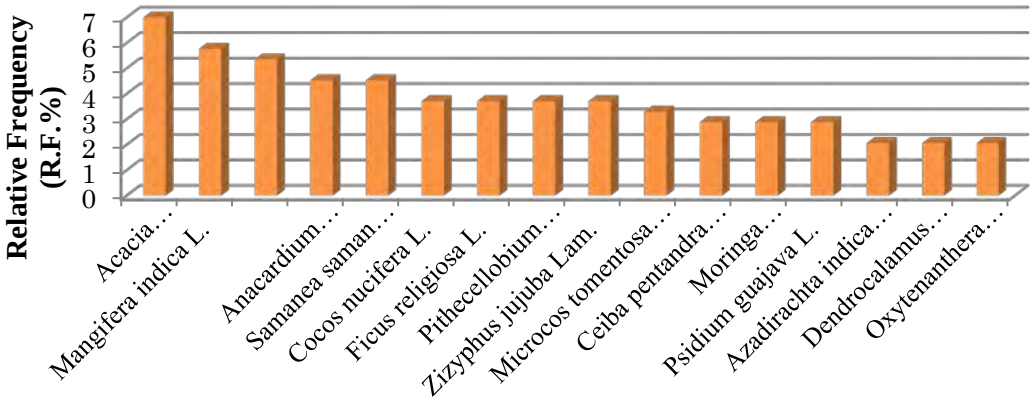
Relative frequency is the frequency of one species compared to the total frequency of all the species. According the results, the cultivated *Acacia auriculiformis* A.Cunn., *(7%), Mangifera*

indica L.*, (6%), Syzygium grande (Wight)* Walp.*, (5.3%), Anacardium occidentale L.,* and *Samanea saman (*Jacq.) Merr.*,* had high equally relative frequency value (4.53%) followed by *Cocos nucifera* L.*, Ficus religiosa* L.*, Pithecellobium dulce* (Roxb.) *Benth.,* and *Zizyphus jujuba* Lam.*,* had equally (4%) respectively. Therefore these species occur everywhere in the study area.

Table 32 Tree Frequency (Direct Zone)

	Scientific Name	Frequency (F)	Relative Frequency (R.F. %)
1	*Acacia auriculiformis* A.Cunn.	0.71	7.00
2	*Mangifera indica* L.	0.58	5.76
3	*Syzygium grande* (Wight) Walp	0.54	5.35
4	*Anacardium occidentale* L.	0.46	4.53
5	*Samanea saman* (Jacq.) Merr.	0.46	4.53
6	*Cocos nucifera* L.	0.38	3.70
7	*Ficus religiosa* L.	0.38	3.70
8	*Pithecellobium dulce* (Roxb.) Benth.	0.38	3.70
9	*Zizyphus jujuba* Lam.	0.38	3.70
10	*Microcos tomentosa* J.E.Smith	0.33	3.29
11	*Ceiba pentandra* Gaertn.	0.29	2.88
12	*Moringa pterygosperma* Gaertn.	0.29	2.88
13	*Psidium guajava* L.	0.29	2.88
14	*Azadirachta indica* A.Juss.	0.21	2.06
15	*Dendrocalamus longispathus* (Kurz)Kurz	0.21	2.06
16	*Oxytenanthera albociliata* Munro	0.21	2.06
17	*Tamarindus indica* L.	0.21	2.06
18	*Artocarpus heterophyllus* Lam.	0.17	1.65
19	*Borassus flabellifer* L.	0.17	1.65
20	*Lannea coromandelica* (Houtt.) Merrr.	0.17	1.65
21	*Pterocarpus macrocarpus* Kurz	0.17	1.65
22	*Sesbania grandiflora* (L.) Poir.	0.17	1.65
23	*Albizia lebbek* (L.) Benth.	0.13	1.23
24	*Careya arborea* Roxb.	0.13	1.23
25	*Gigantochloa nigrociliata* (Buse) Kurz	0.13	1.23
26	*Lagerstroemia speciosa* (L.) Pers.	0.13	1.23
27	*Oroxylum indicum* (L.) Kurz.	0.13	1.23
28	*Spondias pinnata* (L.)Kurz.	0.13	1.23
29	*Streblus asper* Lour.	0.13	1.23
30	*Antidesma* sp.	0.08	0.82
31	*Carallia brachiata* (Lour.) Merr	0.08	0.82
32	*Citrus aurantiifolia* (Christm.) Sw.	0.08	0.82
33	*Crateva adansonii* DC.	0.08	0.82
34	*Delonix regia* (Bojer ex Hook) Rafin.	0.08	0.82
35	*Eucalyptus ovata* Labill.	0.08	0.82
36	*Ficus altissima* Blume	0.08	0.82
37	*Mimusops elengi* L.	0.08	0.82
38	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	0.08	0.82
39	*Acacia concinna* DC.	0.04	0.41
40	*Archidendron jiringa* (Jack) Nielsen	0.04	0.41
41	*Barringtonia acutangula* Kurz.	0.04	0.41
42	*Carica papaya* L.	0.04	0.41
43	*Casuarina equisetifolia* Forst.	0.04	0.41
44	*Chaetocarpus castanocarpus* Thwaites	0.04	0.41
45	*Citharexylum suberratum* Sw.	0.04	0.41
46	*Citrus medica* L.	0.04	0.41
47	*Couroupita guianensis*	0.04	0.41
48	*Dendrocalamus calostachyus* (Kurz) Kurz	0.04	0.41
49	*Diospyros* sp.	0.04	0.41
50	*Dipterocarpus alatus*	0.04	0.41
51	*Erythrina crista-galli*	0.04	0.41
52	*Ficus hispida* L.	0.04	0.41
53	*Ficus lacor* Buch.-Ham.	0.04	0.41

	Scientific Name	Frequency (F)	Relative Frequency (R.F. %)
54	*Fluggea leucopyrus* Willd	0.04	0.41
55	*Garcinia heterandra* Wall.	0.04	0.41
56	*Getonia floribunda* Roxb.	0.04	0.41
57	*Heterophragma adenophyllum* (Willd.)Seem. ex Benth.& Hook.	0.04	0.41
58	*Markhamia stipulata* (Wall.) Seem.ex K.Schum.	0.04	0.41
59	*Phyllanthus emblica* L.	0.04	0.41
60	*Plumeria obtusa*	0.04	0.41
61	*Polyalthia longifolia* (Lam.)Benth. & Hook.f.	0.04	0.41
62	*Pterospermum semisagittatum* Buch.-Ham.	0.04	0.41
63	*Randia erythroclada* Kurz.	0.04	0.41
64	*Sandoricum koetjape* (Burm.f.) Merr.	0.04	0.41
65	*Schleichera oleosa* (Lour.) Oken	0.04	0.41
66	*Senna siamea* (Lam.) Irwin & Barneby	0.04	0.41
67	*Simarouba glauca* DC.	0.04	0.41
68	*Tectona grandis* L. f.	0.04	0.41
69	*Terminalia bellirica* (Gaertn) Roxb.	0.04	0.41
70	*Terminalia catappa* L.	0.04	0.41
71	*Uvaria cordata* Schum. & Thonn.	0.04	0.41



Source: SEZ Management Committee study

In order to clarify the homogeneity and heterogeneity of the floristic distribution in the area, the species distribution by frequency class was examined. According to the outcome of the frequency classes, only one species are in a higher frequency class and the rest of the identified species are in a low to intermediate frequency class. This shows that this area is floristically high degree of heterogeneity while dominated by *Acacia auriculiformis* A.Cunn., as mentioned above.

Table 33 Tree Species Distribution by Frequency Class (Direct Zone)

Frequency class	No. of species
1-20 %	54
20-40%	12
40-60%	4
60-80%	1
80-100%	0

2） Tree Species in Indirect Impact Zone

Note: Bottom 2 photos are *Dalbergia cultrata* Grah. (Endangered species)

Figure 24Mixed Cultivated for Vegetable Fruit (Indirect Zone)

The total number of tree species in 3 representative sample plots is 52 species belonging to 34 genera. The dominant tree species is the cultivate species *Acacia auriculiformis A.Cunn., (Malay-sia-padauk) followed by Anacardium occidentale L., (Thi-ho)* and *Microcos tomentosa J.E.Smith.*, *(Mya-ya)*.

Table 34 Tree Species Population (Indirect Zone)

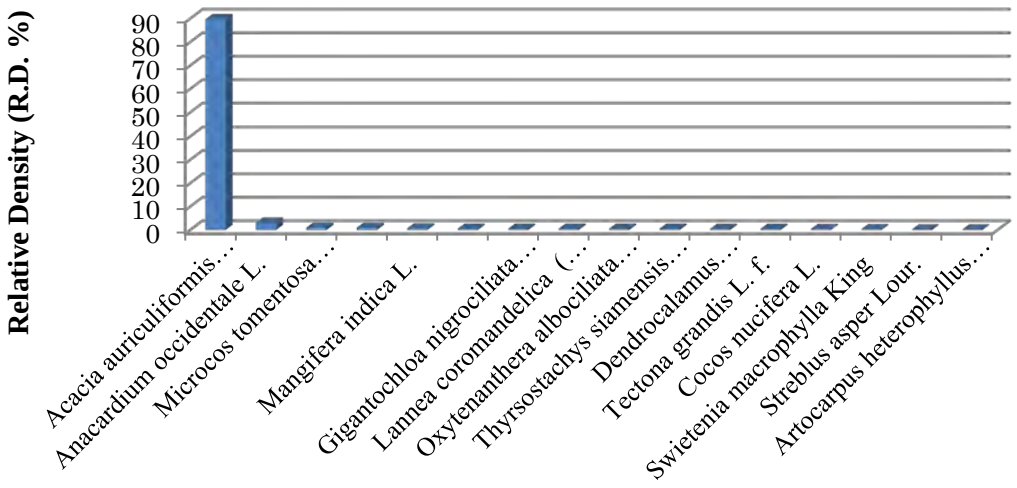
	Scientific Name	No. of individual	Total no. of individual/ha	Total no. of population/ha (%)
1	*Anacardium occidentale* L.	350	31.25	3.04
2	*Acacia auriculiformis* A.Cunn.	10,310	920.54	89.61
3	*Annona squamosa* L.	4	0.36	0.03
4	*Artocarpus heterophyllus* Lam.	10	0.89	0.09
5	*Baccaurea sapida* Muell. Arg.	3	0.27	0.03
6	*Bambusa wamin* E.G. Camus	1	0.09	0.01
7	*Bouea burmanica* Griff.	3	0.27	0.03
8	*Caesalpinia sappan* L.	2	0.18	0.02
9	*Carallia brachiata* (Lour.) Merr	50	4.46	0.43
10	*Careya arborea* Roxb.	10	0.89	0.09
11	*Casacabla thevetia*	1	0.09	0.01
12	*Ceiba pentandra* Gaertn.	9	0.80	0.08
13	*Cephalostachyum pergracile* Munro	2	0.18	0.02
14	*Cocos nucifera* L.	35	3.13	0.30
15	*Cordia myxa* L.	5	0.45	0.04
16	*Couroupita guianensis*	1	0.09	0.01
17	*Dalbergia cultrata* Grah.	5	0.45	0.04
18	*Delonix regia* (Bojer ex Hook) Rafin.	5	0.45	0.04
19	*Dendrocalamus brandisii* (Munro) Kurz	3	0.27	0.03
20	*Dendrocalamus longispathus* (Kurz) Kurz	40	3.57	0.35
21	*Diospyros variegata* Kurz	4	0.36	0.03
22	*Ficus altissima* Blume	1	0.09	0.01
23	*Ficus hispida* L.	5	0.45	0.04
24	*Ficus religiosa* L.	6	0.54	0.05
25	*Garcinia cowa* Roxb.	10	0.89	0.09
26	*Gigantochloa nigrociliata* (Buse) Kurz	50	4.46	0.43
27	*Hevea brasiliensis* (Willd. ex A. Juss.) Muell. Arg.	2	0.18	0.02
28	*Lannea coromandelica* (Houtt.) Merrr.	50	4.46	0.43
29	*Mangifera indica* L.	69	6.16	0.60
30	*Mesua ferrea* L.	4	0.36	0.03
31	*Microcos tomentosa* J.E.Smith	102	9.11	0.89
32	*Millettia atropurpurea* Dunn.	1	0.09	0.01
33	*Mimusops elengi* L.	6	0.54	0.05
34	*Moringa pterygosperma* Gaertn.	5	0.45	0.04
35	*Oxytenanthera albociliata* Munro	50	4.46	0.43
36	*Phyllanthus emblica* L.	1	0.09	0.01
37	*Pithecellobium dulce* (Roxb.) Benth.	4	0.36	0.03
38	*Psidium guajava* L.	3	0.27	0.03
39	*Pterocarpus macrocarpus* Kurz	5	0.45	0.04
40	*Samanea saman* (Jacq.) Merr.	9	0.80	0.08
41	*Sandoricum koetjape* (Burm.f.) Merr.	2	0.18	0.02
42	*Senna siamea* (Lam.) Irwin & Barneby	5	0.45	0.04
43	*Tectona grandis* L. f.	40	3.57	0.35
44	*Streblus asper* Lour.	11	0.98	0.10
45	*Swietenia macrophylla* King	30	2.68	0.26
46	*Syzygium grande* (Wight) Walp	101	9.02	0.88
47	*Tamarindus indica* L.	10	0.89	0.09
48	*Terminalia catappa* L.	6	0.54	0.05
49	*Terminalia chebula* Retz.	1	0.09	0.01
50	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	50	4.46	0.43
51	*Xylia xylocarpa* (Roxb.) Taub.	10	0.89	0.09
52	*Zizyphus jujuba* Lam.	3	0.27	0.03
	Total	**11,505**	**1,027.23**	**100.00**

Source: SEZ Management Committee study

Among the sample plots species density per hectare varied and the highest density was observed *Acacia auriculiformis A.Cunn.*, followed by *Anacardium occidentale L.*,. This indicates that these two species are abundant in this area.

Table 35 Tree Species Relative Density (Indirect Zone)

	Scientific Name	Density (D)	Relative Density (R.D. %)
1	*Acacia auriculiformis* A.Cunn.	3,436.67	89.61
2	*Anacardium occidentale* L.	116.67	3.04
3	*Microcos tomentosa* J.E.Smith	34.00	0.89
4	*Syzygium grande* (Wight) Walp	33.67	0.88
5	*Mangifera indica* L.	23.00	0.60
6	*Carallia brachiata* (Lour.) Merr	16.67	0.43
7	*Gigantochloa nigrociliata* (Buse) Kurz	16.67	0.43
8	*Lannea coromandelica* (Houtt.) Merrr.	16.67	0.43
9	*Oxytenanthera albociliata* Munro	16.67	0.43
10	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	16.67	0.43
11	*Dendrocalamus longispathus* (Kurz) Kurz	13.33	0.35
12	*Tectona grandis* L. f.	13.33	0.35
13	*Cocos nucifera* L.	11.67	0.30
14	*Swietenia macrophylla* King	10.00	0.26
15	*Streblus asper* Lour.	3.67	0.10
16	*Artocarpus heterophyllus* Lam.	3.33	0.09
17	*Careya arborea* Roxb.	3.33	0.09
18	*Garcinia cowa* Roxb.	3.33	0.09
19	*Tamarindus indica* L.	3.33	0.09
20	*Xylia xylocarpa* (Roxb.) Taub.	3.33	0.09
21	*Ceiba pentandra* Gaertn.	3.00	0.08
22	*Samanea saman* (Jacq.) Merr.	3.00	0.08
23	*Ficus religiosa* L.	2.00	0.05
24	*Mimusops elengi* L.	2.00	0.05
25	*Terminalia catappa* L.	2.00	0.05
26	*Cordia myxa* L.	1.67	0.04
27	*Dalbergia cultrata* Grah.	1.67	0.04
28	*Delonix regia* (Bojer ex Hook) Rafin.	1.67	0.04
29	*Ficus hispida* L.	1.67	0.04
30	*Moringa pterygosperma* Gaertn.	1.67	0.04
31	*Pterocarpus macrocarpus* Kurz	1.67	0.04
32	*Senna siamea* (Lam.) Irwin & Barneby	1.67	0.04
33	*Annona squamosa* L.	1.33	0.03
34	*Diospyros variegata* Kurz	1.33	0.03
35	*Mesua ferrea* L.	1.33	0.03
36	*Pithecellobium dulce* (Roxb.) Benth.	1.33	0.03
37	*Baccaurea sapida* Muell. Arg.	1.00	0.03
38	*Bouea burmanica* Griff.	1.00	0.03
39	*Dendrocalamus brandisii* (Munro) Kurz	1.00	0.03
40	*Psidium guajava* L.	1.00	0.03
41	*Zizyphus jujuba* Lam.	1.00	0.03
42	*Caesalpinia sappan* L.	0.67	0.02
43	*Cephalostachyum pergracile* Munro	0.67	0.02
44	*Hevea brasiliensis* (Willd. ex A. Juss.) Muell. Arg.	0.67	0.02
45	*Sandoricum koetjape* (Burm.f.) Merr.	0.67	0.02
46	*Bambusa wamin* E.G. Camus	0.33	0.01
47	*Casacabla thevetia*	0.33	0.01
48	*Couroupita guianensis*	0.33	0.01
49	*Ficus altissima* Blume	0.33	0.01
50	*Millettia atropurpurea* Dunn.	0.33	0.01
51	*Phyllanthus emblica* L.	0.33	0.01
52	*Terminalia chebula* Retz.	0.33	0.01



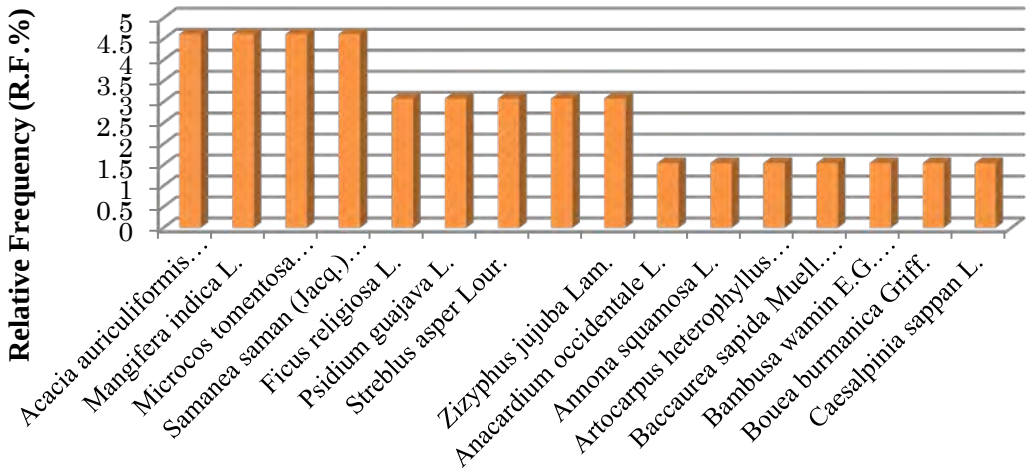
Source: SEZ Management Committee study

Relative frequency is the frequency of one species compared to the total frequency of all the species. According to the results, A*cacia auriculiformis* A.Cunn*., Mangifera indica L., Microcos tomentosa* J.E.Smith., and *Samanea saman* (Jacq.) Merr., had high equally relative frequency value (4.62 %) followed by *Ficus religiosa* L*., Psidium guajava* L*., Streblus asper Lour., Syzygium grande* (Wight) Walp*.,* and *Zizyphus jujuba* Lam., had equally value (3.08%) respectively. These species occur very often in the study area.

Table 36 Tree Species Relative Frequency (Indirect Zone)

	Scientific Name	Frequency (F)	Relative Frequency (R.F.%)
1	*Acacia auriculiformis* A.Cunn.	1.00	4.62
2	*Mangifera indica* L.	1.00	4.62
3	*Microcos tomentosa* J.E.Smith	1.00	4.62
4	*Samanea saman* (Jacq.) Merr.	1.00	4.62
5	*Ficus religiosa* L.	0.67	3.08
6	*Psidium guajava* L.	0.67	3.08
7	*Streblus asper* Lour.	0.67	3.08
8	*Syzygium grande* (Wight) Walp	0.67	3.08
9	*Zizyphus jujuba* Lam.	0.67	3.08
10	*Anacardium occidentale* L.	0.33	1.54
11	*Annona squamosa* L.	0.33	1.54
12	*Artocarpus heterophyllus* Lam.	0.33	1.54
13	*Baccaurea sapida* Muell. Arg.	0.33	1.54
14	*Bambusa wamin* E.G. Camus	0.33	1.54
15	*Bouea burmanica* Griff.	0.33	1.54
16	*Caesalpinia sappan* L.	0.33	1.54
17	*Carallia brachiata* (Lour.) Merr	0.33	1.54
18	*Careya arborea* Roxb.	0.33	1.54
19	*Casacabla thevetia*	0.33	1.54
20	*Ceiba pentandra* Gaertn.	0.33	1.54
21	*Cephalostachyum pergracile* Munro	0.33	1.54
22	*Cocos nucifera* L.	0.33	1.54
23	*Cordia myxa* L.	0.33	1.54
24	*Couroupita guianensis*	0.33	1.54
25	*Dalbergia cultrata* Grah.	0.33	1.54
26	*Delonix regia* (Bojer ex Hook) Rafin.	0.33	1.54
27	*Dendrocalamus brandisii* (Munro) Kurz	0.33	1.54
28	*Dendrocalamus longispathus* (Kurz) Kurz	0.33	1.54
29	*Diospyros variegata* Kurz	0.33	1.54
30	*Ficus altissima* Blume	0.33	1.54
31	*Ficus hispida* L.	0.33	1.54

32	*Garcinia cowa* Roxb.	0.33	1.54
33	*Gigantochloa nigrociliata* (Buse) Kurz	0.33	1.54
34	*Hevea brasiliensis* (Willd. ex A. Juss.) Muell. Arg.	0.33	1.54
35	*Lannea coromandelica* (Houtt.) Merrr.	0.33	1.54
36	*Mesua ferrea* L.	0.33	1.54
37	*Millettia atropurpurea* Dunn.	0.33	1.54
38	*Mimusops elengi* L.	0.33	1.54
39	*Moringa pterygosperma* Gaertn.	0.33	1.54
40	*Oxytenanthera albociliata* Munro	0.33	1.54
41	*Phyllanthus emblica* L.	0.33	1.54
42	*Pithecellobium dulce* (Roxb.) Benth.	0.33	1.54
43	*Pterocarpus macrocarpus* Kurz	0.33	1.54
44	*Sandoricum koetjape* (Burm.f.) Merr.	0.33	1.54
45	*Senna siamea* (Lam.) Irwin & Barneby	0.33	1.54
46	*Tectona grandis* L. f.	0.33	1.54
47	*Swietenia macrophylla* King	0.33	1.54
48	*Tamarindus indica* L.	0.33	1.54
49	*Terminalia catappa* L.	0.33	1.54
50	*Terminalia chebula* Retz.	0.33	1.54
51	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	0.33	1.54
52	*Xylia xylocarpa* (Roxb.) Taub.	0.33	1.54



Source: SEZ Management Committee study

In order to clarify the homogeneity and heterogeneity of the floristic distribution in the area, the species distribution by frequency class was examined. According to the outcome of the frequency classes, only 4 species are in high frequency class and 48 of the species are in an intermediate frequency class. The area could be considered floristically heterogeneous.

Table 37 Tree Species Frequency Class (Indirect Zone)

Frequency class	No. of species
1-20 %	0
20-40%	43
40-60%	0
60-80%	5
80-100%	4

Source: SEZ Management Committee study

D) Bamboo Ecosystems in Project Area

Table 38 Bamboo Species (Indirect and Direct Zone)

	Common Name	Scientific Name	Family Name
1	Hti-yoe-wa	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	Poaceae

2	Kya-khat-wa	*Bambusa bambos* (L.) Voss	Poaceae
3	Tin-wa/Khae-tan-kyi-tauk-wa	*Cephalostachyum pergracile* Munro	Poaceae
4	Wa-bo	*Dendrocalamus brandisii* (Munro) Kurz	Poaceae
5	Wa-gauk	*Oxytenanthera albociliata* Munro	Poaceae
6	Wa-min	*Bambusa wamin* E.G. Camus	Poaceae
7	Wa-net	*Dendrocalamus longispathus* (Kurz)Kurz	Poaceae
8	Wa-ya	*Gigantochloa nigrociliata* (Buse) Kurz	Poaceae

Source: SEZ Management Committee study

Figure 25 Bamboo Patches in Direct Impact Zone

The bamboo species collected in 6 representative sample plots are 7 species belonging to 6 genera. The dominant bamboo species are *Oxytenanthera albociliata* Munro., (Wa-gauk), *Gigantochloa nigrociliata* (Buse) Kurz., (Wa-ya) and *Dendrocalamus longispathus* (Kurz) Kurz., (Wa-net).

Table 39 Bamboo Patch Population (Direct Zone)

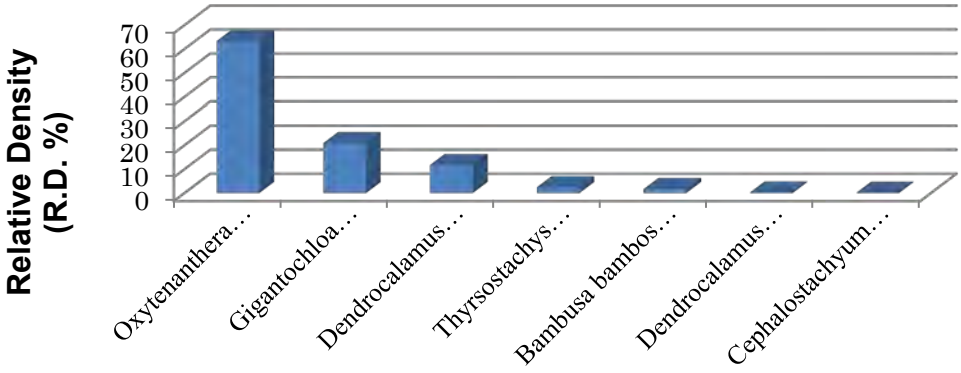
	Scientific Name	No. of individual	Total no. of individual/ha	Total no. of population/ha (%)
1	*Bambusa bambos* (L.) Voss	23	2.71	1.59
2	*Cephalostachyum pergracile* Munro	1	0.12	0.07
3	*Dendrocalamus brandisii* (Munro) Kurz	3	0.35	0.21
4	*Dendrocalamus longispathus* (Kurz) Kurz	169	19.88	11.70
5	*Gigantochloa nigrociliata* (Buse) Kurz	301	35.41	20.83
6	*Oxytenanthera albociliata* Munro	914	107.53	63.25
7	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	34	4.00	2.35
	Total	**1,445**	**170.00**	**100.00**

Source: SEZ Management Committee study

Table 40 Bamboo Patch Relative Density (Direct Zone)

	Scientific Name	Density (D)	Relative Density (R.D. %)
1	*Oxytenanthera albociliata* Munro	114.25	63.25
2	*Gigantochloa nigrociliata* (Buse) Kurz	37.63	20.83
3	*Dendrocalamus longispathus* (Kurz) Kurz	21.13	11.70
4	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	4.25	2.35
5	*Bambusa bambos* (L.) Voss	2.88	1.59

	Scientific Name	Density (D)	Relative Density (R.D. %)
6	*Dendrocalamus brandisii* (Munro) Kurz	0.38	0.21
7	*Cephalostachyum pergracile* Munro	0.13	0.07



Source: SEZ Management Committee study

In order to clarify the homogeneity and heterogeneity of the floristic distribution in the area, the species distribution by frequency class was examined. There are only 5 species of bamboo in the project area with 3 species in medium-high to high frequency and the rest in lower frequency classes. The area could be considered floristically heterogeneous within this particular trophic zone.

Table 41 Bamboo Patch Species Frequency (Direct Zone)

	Scientific Name	Frequency (F)	Relative Frequency (R.F.%)
1	*Gigantochloa nigrociliata* (Buse) Kurz	0.88	26.92
2	*Oxytenanthera albociliata* Munro	0.75	23.08
3	*Dendrocalamus longispathus* (Kurz) Kurz	0.63	19.23
4	*Dendrocalamus brandisii* (Munro) Kurz	0.38	11.54
5	*Thyrsostachys siamensis* (Kurz ex Munro) Gamble	0.38	11.54
6	*Bambusa bambos* (L.) Voss	0.13	3.85
7	*Cephalostachyum pergracile* Munro	0.13	3.85

Source: SEZ Management Committee study

Table 42 Bamboo Species Frequency Class (Direct Zone)

Frequency class	No. of species
1-20 %	2
20-40%	2
40-60%	0
60-80%	2
80-100%	1

Source: SEZ Management Committee study

E) Cultivated Plantation Ecosystems

1） Direct Impact Zone

Figure 26Monoculture Plantation (Direct Zone)

The total number of tree species in this area collected in 9 representative sample plots is 2 species belonging to 2 genera. The dominant monoculture species are *Acacia auriculiformis.*, (Malay-sia-padauk).

Table 43 Monoculture Tree Species Population (Direct Zone)

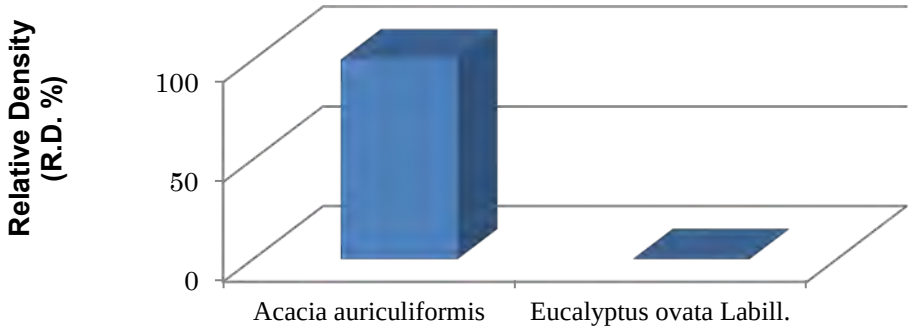
	Scientific Name	No. of individual	Total no. of individual/ha	Total no. of population/ha (%)
1	*Acacia auriculiformis*	111,664	6,344.55	99.99
2	*Eucalyptus ovata* Labill.	15	0.85	0.01
	Total	**111,679**	**6,345.40**	**100.00**

Source: SEZ Management Committee study

Among the sample plots species density per hectare varied and the highest density was observed *Acacia auriculiformis* followed by *Eucalyptus ovata* Labill. This shows that these one species are abundant in this area.

Table 44 Monoculture Tree Species Relative Density (Direct Zone)

	Scientific Name	Density (D)	Relative Density (R.D. %)
1	*Acacia auriculiformis*	12,407.11	99.99
2	*Eucalyptus ovata* Labill.	1.67	0.01



Source: SEZ Management Committee study

Relative frequency is the frequency of one species compared to the total frequency of all the species. According to the results, *Acacia auriculiformis* is high relative frequency value (90%) followed by *Eucalyptus ovata* Labill., (10%) respectively. Therefore these species occur extremely often and are more or less completely homogenous.

Table 45 Monoculture Tree Species Relative Frequency (Direct Zone)

	Scientific Name	Frequency (F)	Relative Frequency (R.F.%)
1	*Acacia auriculiformis*	1	90
2	*Eucalyptus ovata* Labill.	0.11	10

Source: SEZ Management Committee study

2） Indirect Impact Zone

Figure 27Monoculture Plantation

The total number of tree species in this area collected in 2 representative sample plots is 1 species belonging to 1 genus. The tree species is *Acacia auriculiformis* (Malay-sia-padauk).

Table 46 Tree Species Population

	Scientific Name	No. of individual	Total no. of individual/ha	Total no. of population/ha (%)
1	*Acacia auriculiformis*	450	482.57	100
	Total	**450**	**482.57**	**100**

Source: SEZ Management Committee study

3） Cultivated Ornamental and Vegetable Species Identified

In addition to the tree species identified above, the following species were also identified in the mostly cultivated terrestrial ecosystem.

Table 47 Cultivated Ornamental and Vegetable Species (Perennial)

	Common Name	Scientific Name	Family Name
1	A-da-lut	*Canna edulis* Ker Gawl.	Cannaceae
2	Amyauk-san	*Couroupita guianensis*	Lecythidaceae

	Common Name	Scientific Name	Family Name
3	Aw-za	*Annona squamosa* L.	Annonaceae
4	Dan-tha-lun	*Moringa pterygosperma* Gaertn.	Moringaceae
5	Eu-ca-lit	*Eucalyptus ovata* Labill.	Myrtaceae
6	Gan-gaw	*Mesua ferrea* L.	Hypericaceae
7	Hpi-gyan-nget-pyaw	*Musa malaccensis* Ridl.	Musaceae
8	Htika-yone	*Neptunia javanica* Miq.	Mimosaceae
9	Ka-mon-chin	*Acacia concinna* (Willd.) DC.	Mimosaceae
10	Kha-yan-chin	*Lycopersicon esculentum* Mill.	Solanaceae
11	Kyan	*Saccharum officinarum* L.	Poaceae
12	Kyet-paung	*Hevea brasiliensis* (Willd. ex A. Juss.) Muell. Arg.	Euphorbiaceae
13	Kyun	*Tectona grandis* L. f.	Verbenaceae
14	Ma-haw-ga-ni	*Swietenia macrophylla* King	Meliaceae
15	Ma-la-ka	*Psidium guajava* L.	Myrtaceae
16	Ma-lay-sha-padauk	*Acacia auriculiformis* A.Cunn.	Mimosaceae
17	Ma-yan	*Bouea burmanica* Griff.	Anacardiaceae
18	Na-yoke-kaung	*Piper longum* L.	Piperaceae
19	Nget-pyaw	*Musa* sp. (1)	Musaceae
20	Nga-yoke	*Capsicum frutescens*	Solanaceae
21	Nget-pyaw-chin	*Musa* sp. (2)	Musaceae
22	Nwe-pe	*Lablab purpureus*	Fabaceae
23	Ohn	*Cocos nucifera* L.	Arecaceae
24	Pauk-pan-phyu	*Sesbania grandiflora* (L.) Poir.	Fabaceae
25	Pein-gyi	*Alocasia macrorrhizos* (L.) G. Don	Araceae
26	Pein-ne	*Artocarpus heterophyllus* Lam.	Moraceae
27	Pe-zaung-ya	*Dolichos tetragonolobus* L.	Fabaceae
28	Phan-kha	*Terminalia chebula* Retz.	Combretaceae
29	Pinle-ga-bwe	*Casuarina equisetifolia* Forst.	Casuarinaceae
30	Pin-sein	*Ocimum sanctum* L.	Lamiaceae
31	Pyin-ka-do	*Xylia xylocarpa* (Roxb.) Taub.	Mimosaceae
32	Se-hna-ya-thi	*Casacabla thevetia*	Apocynaceae
33	Sein-pan-gyi	*Delonix regia* (Bojer ex Hook) Rafin.	Caesalpiniaceae
34	Shauk	*Citrus medica* L.	Rutaceae
35	Shwe-nget-pyaw	*Musa sapientum* var. *rubra* Firminger	Musaceae
36	Si-tha-bye	*Simarouba glauca* DC.	Simaroubaceae
37	Ta-ma	*Azadirachta indica* A.Juss.	Meliaceae
38	Taung-tha-le	*Garcinia cowa* Roxb.	Hypericaceae
39	Tayok-saga-aphyu	*Plumeria obtusa* L.	Apocynaceae
40	Tha-na-kha-pan	*Aglaia odorata* Lour.	Meliaceae
41	Than-pa-ya	*Citrus aurantiifolia* (Christm.) Sw.	Rutaceae
42	Tha-yet	*Mangifera indica* L.	Anacardiaceae
43	Thi-ho	*Anacardium occidentale* L.	Anacardiaceae
44	Thin-baw	*Carica papaya* L.	Caricaceae
45	Wet-ma-lut	*Musa sinensis* Sw.	Musaceae
46	Yakhaing-nget-pyaw	*Musa sapientum* var. *arakanensis* Ripl.	Musaceae
47	Ye-hmwe-pan	*Angelonia cornigera* Hook.	Scrophulariaceae
48	Ye-ta-ma	*Polyalthia longifolia* (Lam.)Benth. & Hook.f.	Annonaceae
49	Ye-yo	*Morinda angustifolia* Roxb.	Rubiaceae
50	Zi-za-wa	*Gardenia lucida* Roxb.	Rubiaceae

Source: SEZ Management Committee study

Table 48 Cultivated Ornamental and Vegetable Species (Annual)

	Common Name	Scientific Name	Family Name
1	Gan-da-mar	*Chrysanthemum roxburghii* Desf.	Asteraceae
2	Bu-pin	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae
3	Chin-paung-ni	*Hibiscus sabdariffa* L.	Malvaceae
4	Chin-paung-phyu	*Hibiscus surratensis* L.	Malvaceae
5	Kha-yan	*Solanum melongena* L.	Solanaceae
6	Kon-ka-zun	*Ipomoea sagittata* Poir.	Convolvulaceae
7	Kun	*Piper betel* L.	Piperaceae
8	May-myo	*Callistephus chinensis*	Asteraceae
9	Mon-la	*Raphanus sativus* L.	Brassicaceae
10	Taing-taung-pe	*Vigna peduncularis*(Kunth)Fawc.& Rendle	Fabaceae
11	Yon-padi	*Hibiscus esculentus* L.	Malvaceae

Source: SEZ Management Committee study

F) Aquatic Ecosystems in Project Area

The aquatic ecosystem of studied area includes brackish water ecosystem (Mangrove ecosystem) and fresh water ecosystem. The brackish water ecosystem comprises Kayet Creek (Both direct and indirect), Gwe Creek (Both direct and indirect), Baybauk Creek (Both direct and indirect), Phalan Creek (Both direct and indirect), and Shwebyauk Creek (Both direct and indirect impact zone). The fresh water ecosystem includes Thilawa Reservoir and the lake near Phalan Kanoo Monastery.

1） Mangrove Ecosystem (Direct Zone)

The following species were identified in and around the Project area.

Table 49 Mangrove Species (Direct Zone)

	Common Name	Scientific Name	Family Name
1	Da-ni	*Nypa fruticans* Wurmb	Arecaceae
2	Ka-na-zo	*Heritiera littoralis* Dryand.	Sterculiaceae
3	Kat-ma-lar	*Sonneratia apetala* Buch.-Ham	Sonneratiaceae
4	La-mu	*Sonneratia caseolaris* (L.)Engl.	Sonneratiaceae
5	Ma-da-ma	*Ceriops decandra* (Griff.)Ding Hou	Rhizophoraceae
6	Tha-mae	*Avicennia officinalis* L.	Avicenniaceae
7	Tha-met-ywet-leik	*Avicennia marina* (Forsk)Vierh.	Avicenniaceae
8	Tha-yaw	*Excoecaria agallocha* L.	Euphorbiaceae
9	Ye-kha-ya	*Aegiceras coniculatum* (L.)Blanco	Myrsinaceae

Source: SEZ Management Committee study

Table 50 Mangrove Associated Species (Direct Zone)

	Common Name	Scientific Name	Family Name	Perennial	Annual (Rainy Season)
1	A-lo-lay	*Caesalpinia crista* L.	Caesalpiniaceae	✓	✓
2	Ana-nya-kokko	*Albizia lebbek* (L.) Benth.	Mimosaceae	✓	✓
3	Byaik	*Dalbergia spinosa* Roxb.	Fabaceae	✓	✓
4	Kha-mon	*Hoya burmanica* Rolfe	Asclepiadaceae	✓	✓
5	Kha-ru	*Pluchea indica* (L.)Less.	Asteraceae	✓	✓
6	Kha-ya	*Acanthus ilicifolius* L.	Acanthaceae	✓	✓
7	Khwe-lae-ya	*Canavalia cathartica*	Fabaceae	✓	✓
8	Khwe-la-ya	*Mucuna pruriens*	Fabaceae	✓	✓
9	Mi-chaung-pan	*Derris trifoliata* Lour.	Fabaceae	✓	✓
10	Myauk-kyein	*Flagellaria indica* L.	Flagellariaceae	✓	✓
11	Nget-kyi-taung	*Acrostichum speciosum*	Pteridaceae	✓	✓
12	Not known	*Pontederia* sp.	Pontederiaceae	✓	✓
13	Not known	*Melanthera biflora* (L.) Wild	Asteraceae	✓	✓
14	Not known	*Fimbristylis ferruginea* Vahl	Cyperaceae	✓	✓
15	Not known	*Derris scandens*	Fabaceae	✓	✓
16	Nyan	*Sesbania paludosa* Roxb.	Fabaceae	✓	✓
17	Shwe-nwee	*Cassytha filiformis* L.	Lauraceae	✓	✓
18	Sit	*Albizia procera* (Roxb.) Benth.	Mimosaceae	✓	✓
19	Taung-ka-thit	*Erythrina crista-galli*	Fabaceae	✓	✓
20	Taw-kyaung-pan	*Clerodendrum inerme* Gaertn.	Verbenaceae	✓	✓
21	Taw-kyet-thon	*Ipomoea violacea* L.	Convolvulaceae	✓	✓
22	Taw-sa-byit	*Cayratia trifolia* (L.) Domin	Vitaceae	✓	✓
23	Tha-baw	*Pandanus foetidus* Roxb.	Pandanaceae	✓	✓
24	Tha-khut	*Dolichandrone spathacea* (L. f.) K. Schum.	Bignoniaceae	✓	✓
25	Tha-nat	*Cordia myxa* L.	Boraginaceae	✓	✓
26	Thin-paung	*Phoenix paludosa* Roxb.	Arecaceae	✓	✓
27	Thon-dauk-myat	*Cyperus exaltatus* Retz	Cyperaceae	-	✓
28	Ka-thit	*Erythrina* sp.	Fabaceae	-	✓

29	Ko-yan-gyi	*Crinum asiaticum* L.	Amaryllidaceae	-	✓
30	Myauk-u	*Dioscorea sativa* L.	Dioscoreaceae	-	✓
31	Not known	*Crinum* sp.	Amaryllidaceae	-	✓

Source: SEZ Management Committee study

Source: SEZ Management Committee study

Figure 28 Typical Mangrove Area (Direct Zone)

Total numbers of species collected in the studied area are altogether 36 mangrove and mangrove associated species. However, only four mangrove species belonging to 3 genera and other three species are growing in large patches to be collected in 7 representative plots. The dominant mangrove species in this area are *Sonneratia caseolaris* (L.) Engl., (La-mu) followed by *Avicennia officinalis* L., (Tha-mae), and *Sonneratia apetala* Buch.-Ham., (Kant-ma-lar), *Excoecaria agallocha* L., (Tha-yaw). The other two species are growing sparsely along the creeks. These species are *Nypa fruticans* and *Avicennia marina*.

Table 51 Mangrove Species Population (Direct Zone)

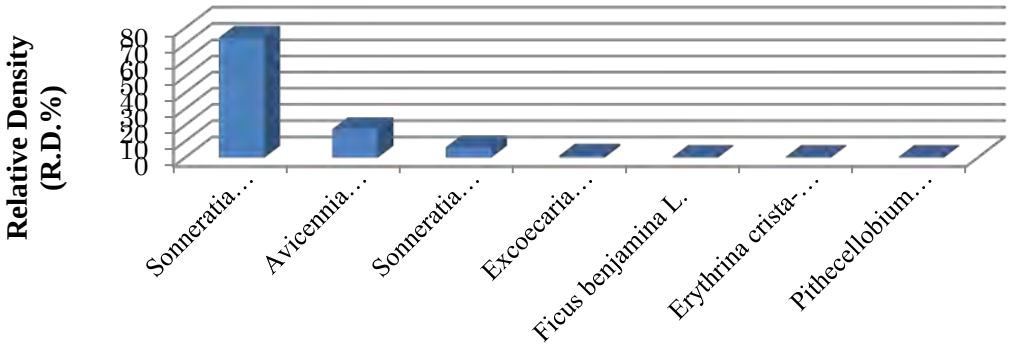
	Scientific Name	No. of individual	Total no. of individual/ha	Total no. of population/ha(%)
1	*Ficus benjamina* L.	1	0.91	0.35
2	*Avicennia officinalis* L.	50	45.45	17.54
3	*Excoecaria agallocha* L.	3	2.73	1.05
4	*Sonneratia apetala* Buch.-Ham	18	16.36	6.32
5	*Sonneratia caseolaris* (L.)Engl.	211	191.82	74.04
6	*Erythrina crista-galli*	1	0.91	0.35
7	*Pithecellobium dulce* (Roxb.) Benth.	1	0.91	0.35
	Total	**285**	**259.09**	**100.00**

Source: SEZ Management Committee study

Among the sample plots species density per hectare varied and the highest density was observed *Sonneratia caseolaris* (L.)Engl., followed by *Avicennia officinalis* L., and *Sonneratia apetala* Buch.-Ham. This shows that these three species are abundant in this area.

Table 52 Relative Density of Mangrove Species (Direct Zone)

	Scientific Name	Density (D)	Relative Density (R.D. %)
1	*Sonneratia caseolaris* (L.)Engl.	30.14	74.04
2	*Avicennia officinalis* L.	7.14	17.54
3	*Sonneratia apetala* Buch.-Ham	2.57	6.32
4	*Excoecaria agallocha* L.	0.43	1.05
5	*Ficus benjamina* L.	0.14	0.35
6	*Erythrina crista-galli*	0.14	0.35
7	*Pithecellobium dulce* (Roxb.) Benth.	0.14	0.35



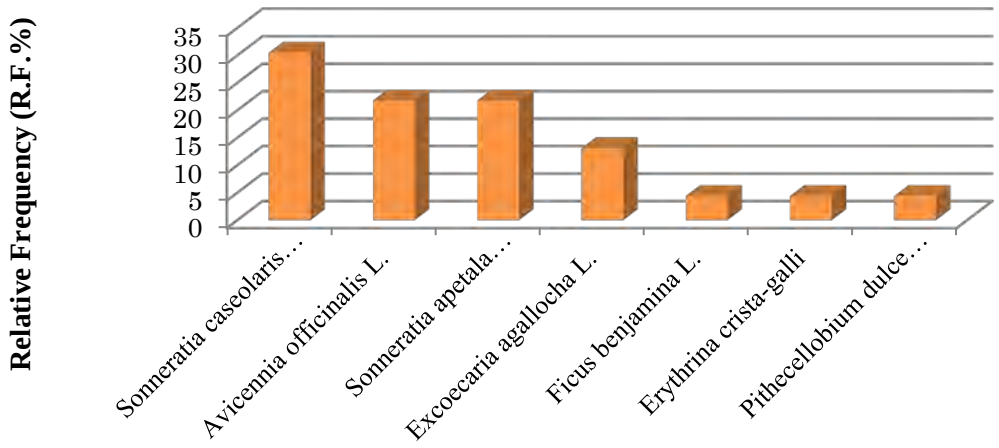
Source: SEZ Management Committee study

Relative frequency is the frequency of one species compared to the total frequency of all the species. *Sonneratia caseolaris* (L.) Engl., is high relative frequency value (30.44%) followed by *Avicennia officinalis* L., and *Sonneratia apetala* Buch.-Ham., (21.74%) are equal *Excoecaria agallocha* L., (13.04%) respectively. Therefore these species occur often in the study area.

Table 53 Relative Frequency of Mangrove Species (Direct Zone)

	Scientific Name	Frequency (F)	Relative Frequency (R.F. %)
1	*Sonneratia caseolaris* (L.)Engl.	1.00	30.43
2	*Avicennia officinalis* L.	0.71	21.74
3	*Sonneratia apetala* Buch.-Ham	0.71	21.74
4	*Excoecaria agallocha* L.	0.43	13.04
5	*Ficus benjamina* L.	0.14	4.35

6	*Erythrina crista-galli*	0.14	4.35
7	*Pithecellobium dulce* (Roxb.) Benth.	0.14	4.35



Source: SEZ Management Committee study

In order to clarify the homogeneity and heterogeneity of the floristic distribution in the area, the species distribution by frequency class was examined. According to the outcome of the frequency classes, only 1 species is in the highest frequency class and 3 species are in the low frequency class. This shows that this area has a low to medium degree of heterogeneity.

Table 54 Species distribution by frequency class (Direct Zone)

Frequency class	No. of species
1-20 %	3
20-40%	0
40-60%	1
60-80%	2
80 - 100 %	1

Source: SEZ Management Committee study

The distribution of GBH interval class reveals the dominant of small stem individuals in the area. 48.65% of the mangroves sampled are less than 40cm GBH. Large stem individuals with GBH more than 80cm are only 8.10%. The majority of the trees are less than 60cm in diameter, which indicates that the mangrove habitats are marginal and in a degraded state.

Table 55 Mangrove species in GBH class interval (Direct Zone)

GBH Class	Total number of individual	% of total population
<40cm	126	48.65
41-60cm	82	31.66
61-80cm	31	11.97
81-100cm	15	5.79
>101cm	6	2.32
Total	**259**	**100.00**

Source: SEZ Management Committee study

The distribution of height class shows that 184 individuals are less than 10 meters, comprising 71% and of the total population only 1.5% of the individuals sampled were above 15m in height. Again, this indicates a marginal mangrove ecosystem.

Table 56 Mangrove species in Height class interval (Direct Zone)

Height Class	Total number of individual	% of total population
<10m	184	71.04247
11-15m	72	27.79923
16-20m	4	1.544402
21-25m	0	0
>26m	0	0
Total	**259**	**100.00**

Source: SEZ Management Committee study

2） Mangrove Ecosystem (Indirect Zone)

Source: SEZ Management Committee study

Total numbers of species collected in the indirect zone mangrove ecosystem study area are

36 mangrove and mangrove associated species. However, only 4 mangrove species belonging to 3 genera and other 5 species are growing in large patches to be collected in 5 representative plots. The dominant mangrove species in this area are *Sonneratia caseolaris* (L.)Engl., (La-mu) and *Avicennia officinalis* L., (Tha-mae) followed by *Excoecaria agallocha* L., (Tha-yaw) and *Sonneratia apetala* Buch.-Ham., (Kant-ma-lar). The other two species are growing sparsely along the creeks. These species are *Nypa fruticans* and *Avicennia marina*.

Table 57 Mangrove Species Population (Indirect Zone)

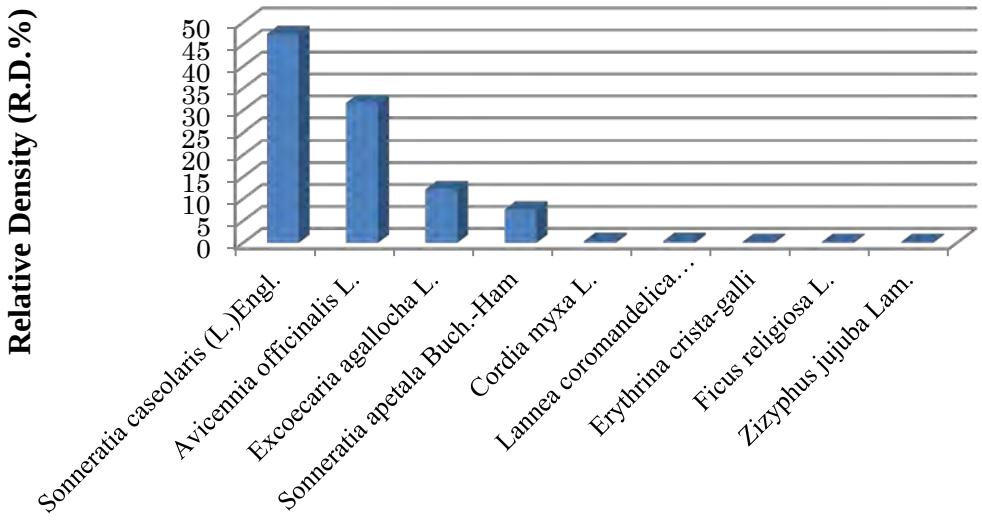
	Scientific Name	No. of individual	Total no. of individuals/ha	Total no. of population/ha (%)
1	*Avicennia officinalis* L.	180	90.45	31.69
2	*Cordia myxa* L.	2	1.01	0.35
3	*Erythrina crista-galli*	1	0.50	0.18
4	*Excoecaria agallocha* L.	69	34.67	12.15
5	*Ficus religiosa* L.	1	0.50	0.18
6	*Lannea coromandelica* (Houtt.)Merr.	2	1.01	0.35
7	*Sonneratia apetala* Buch.-Ham	43	21.61	7.57
8	*Sonneratia caseolaris* (L.)Engl.	269	135.18	47.36
9	*Zizyphus jujuba* Lam.	1	0.50	0.18
	Total	**568**	**285.43**	**100.00**

Source: SEZ Management Committee study

Among the sample plots species density per hectare varied and the highest density was observed *Avicennia officinalis* L., and *Sonneratia caseolaris* (L.) Engl., followed by *Excoecaria agallocha* L., and *Sonneratia apetala* Buch.-Ham. These four species are abundant in this area.

Table 58 Relative Density of Mangrove Species (Indirect Zone)

	Scientific Name	Density (D)	Relative Density (R.D. %)
1	*Sonneratia caseolaris* (L.)Engl.	26.9	47.36
2	*Avicennia officinalis* L.	18.0	31.69
3	*Excoecaria agallocha* L.	6.9	12.15
4	*Sonneratia apetala* Buch.-Ham	4.3	7.57
5	*Cordia myxa* L.	0.2	0.35
6	*Lannea coromandelica* (Houtt.)Merr.	0.2	0.35
7	*Erythrina crista-galli*	0.1	0.18
8	*Ficus religiosa* L.	0.1	0.18
9	*Zizyphus jujuba* Lam.	0.1	0.18

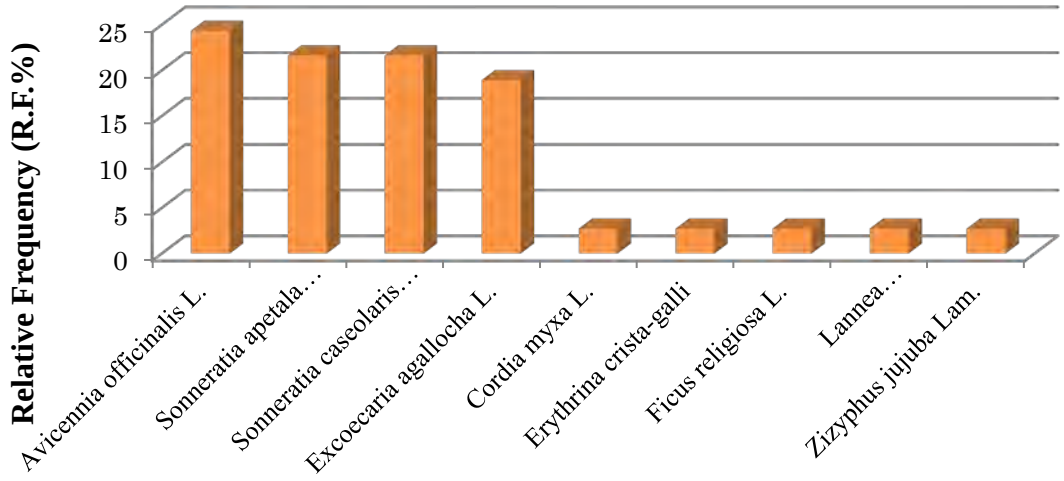


Source: SEZ Management Committee study

Relative frequency is the frequency of one species compared to the total frequency of all the species. According to the results, *Avicennia officinalis* L., is (24.32%) high and *Sonneratia apetala* Buch.-Ham., and *Sonneratia caseolaris* (L.) Engl., are relative frequency value (21.62%) followed is *Excoecaria agallocha* L., is (19%) and respectively. These species are common in the study area.

Table 59 Relative Frequency of Mangrove Species (Indirect Zone)

	Scientific Name	Frequency (F)	Relative Frequency (R.F. %)
1	*Avicennia officinalis* L.	0.9	24.32
2	*Sonneratia apetala* Buch.-Ham	0.8	21.62
3	*Sonneratia caseolaris* (L.)Engl.	0.8	21.62
4	*Excoecaria agallocha* L.	0.7	18.92
5	*Cordia myxa* L.	0.1	2.70
6	*Erythrina crista-galli*	0.1	2.70
7	*Ficus religiosa* L.	0.1	2.70
8	*Lannea coromandelica* (Houtt.)Merr.	0.1	2.70
9	*Zizyphus jujuba* Lam.	0.1	2.70



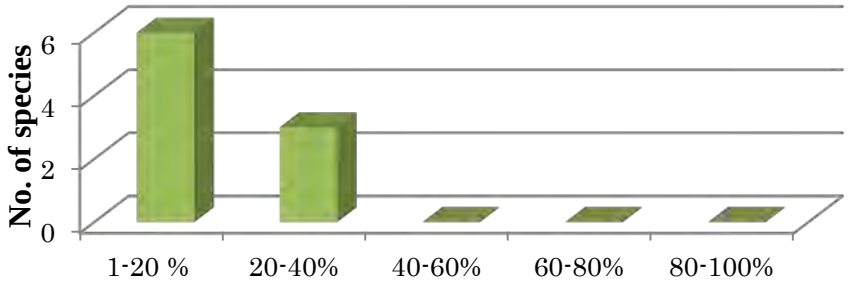
Source: SEZ Management Committee study

In order to clarify the homogeneity and heterogeneity of the floristic distribution in the area, the species distribution by frequency class was examined. According to the outcome of the frequency classes, only two species are in high frequency class and 9% of the species are in low frequency class. This shows that this area is floristically high degree of heterogeneity without a high degree of dominance of any one species.

Table 60 Species distribution by frequency class (Indirect Zone)

Frequency class	No. of species
1-20 %	6
20-40%	3
40-60%	0
60-80%	0
80-100%	0

Source: SEZ Management Committee study



Source: SEZ Management Committee study

The distribution of GBH interval class reveals the dominance of small stem individuals in the area. 69.89% of the mangrove species are less than 40cm GBH. Large stem individuals with GBH more than 80cm are about 5.99%. Majority of the trees are less than 40cm in diameter, which indicates that the forests are marginal and degraded.

Table 61 Mangrove species in GBH class interval (Indirect Zone)

DBH Class	Total number of individual	% of total population
<40cm	199	69.89
41-60cm	47	16.55
61-80cm	22	7.57
81-100cm	14	4.93
>101cm	3	1.06
	285	**100.00**

Source: SEZ Management Committee study

The distribution of height class shows that 257 individuals are less than 10 meters, comprising 90.32% and of the total population and 28 individuals are more than 15 meters, comprising 9.68% of the total population. The low height class of the studied area indicates a degraded mangrove ecosystem in the indirect zone.

Table 62 Mangrove species in Height class interval (Indirect Zone)

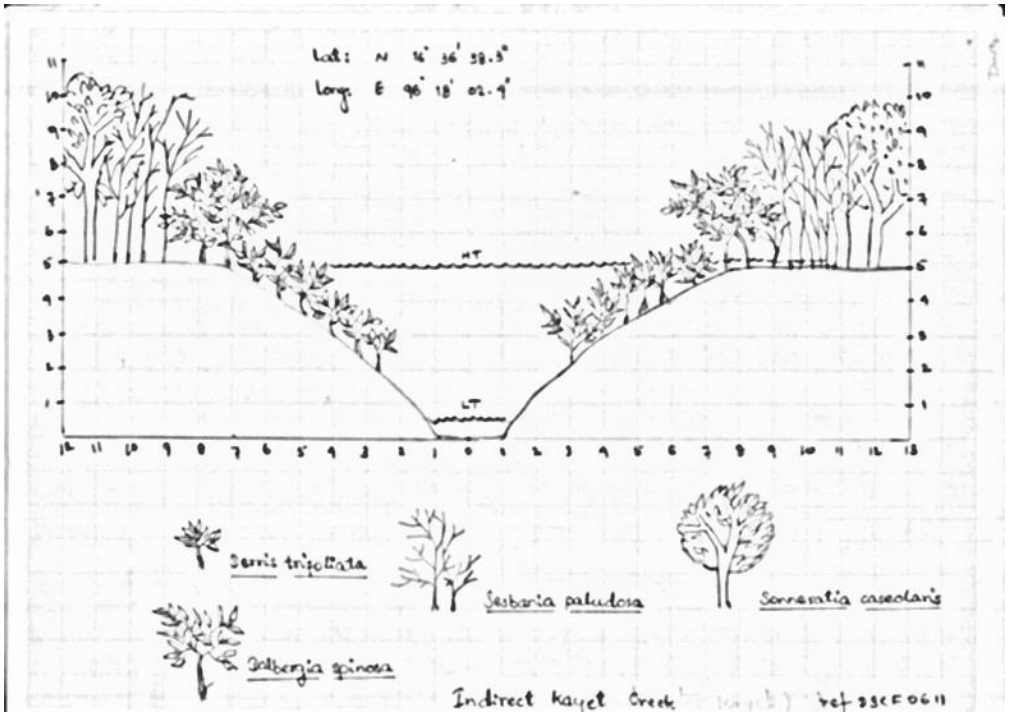
Height Class	Total number of individual	% of total population
<10m	258	90.32
11-15m	28	9.68
16-20m	0	0
21-25m	0	0

>26m	0	0
Total	**285**	**100**

Source: SEZ Management Committee study

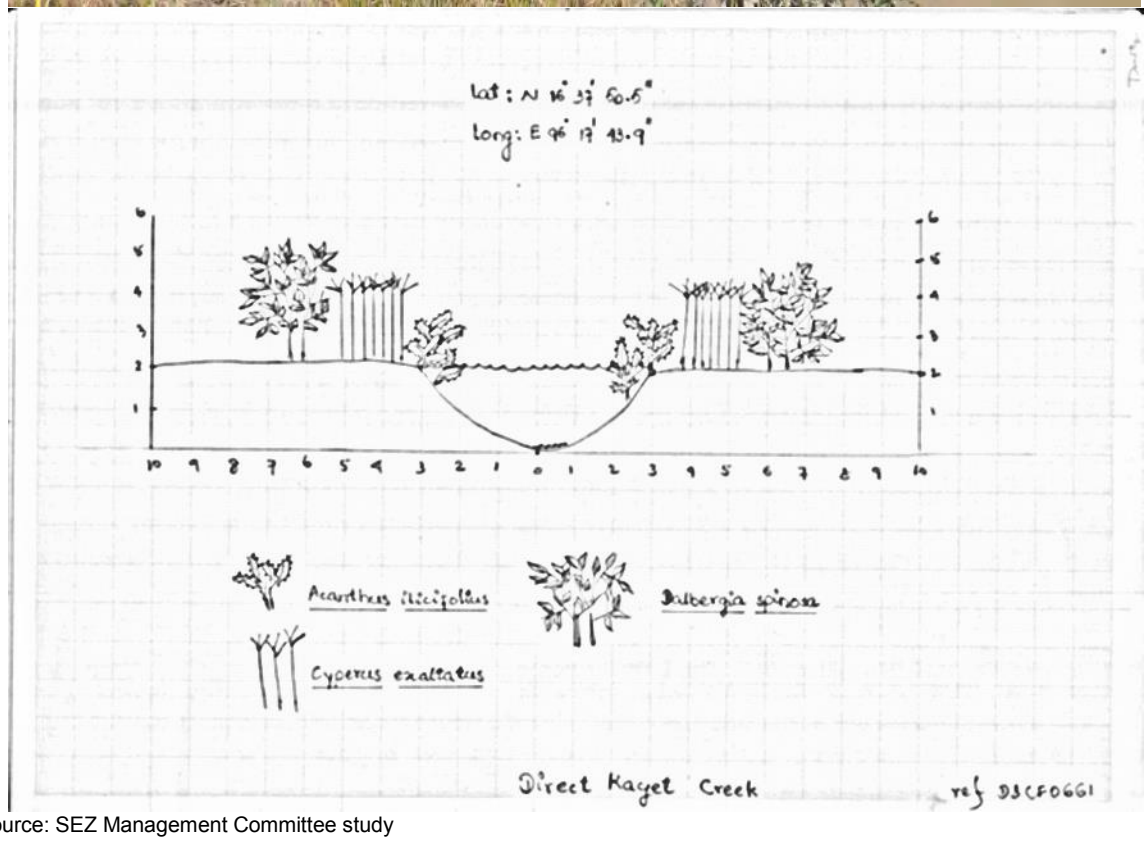
3) Mangrove Ecosystem Profiles in Creeks with Mangroves

Below are described the vegetation profiles of the five main mangrove areas in the Project area.



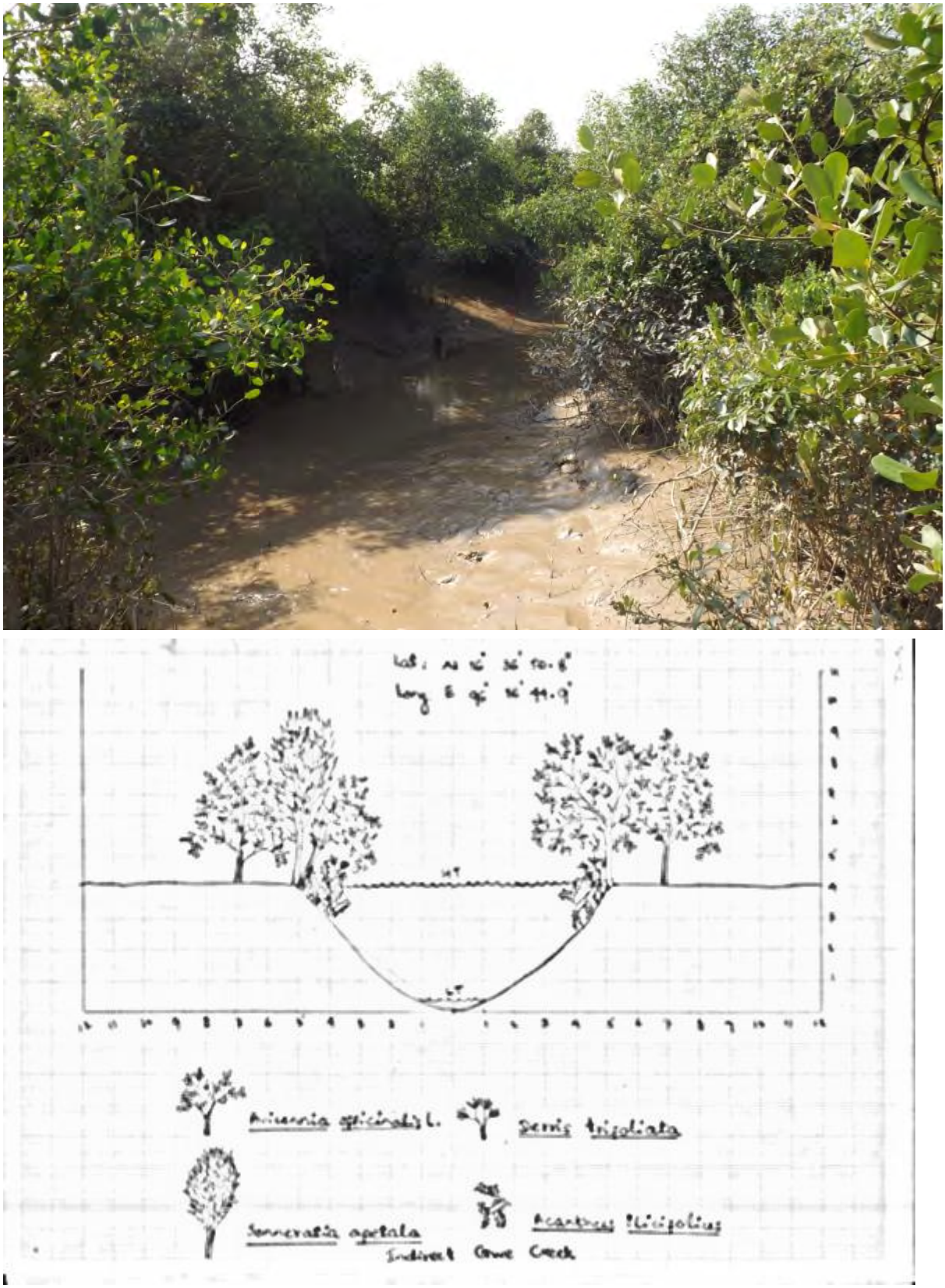
Source: SEZ Management Committee study

Figure 29Indirect Kayet Creek Mangrove Profile



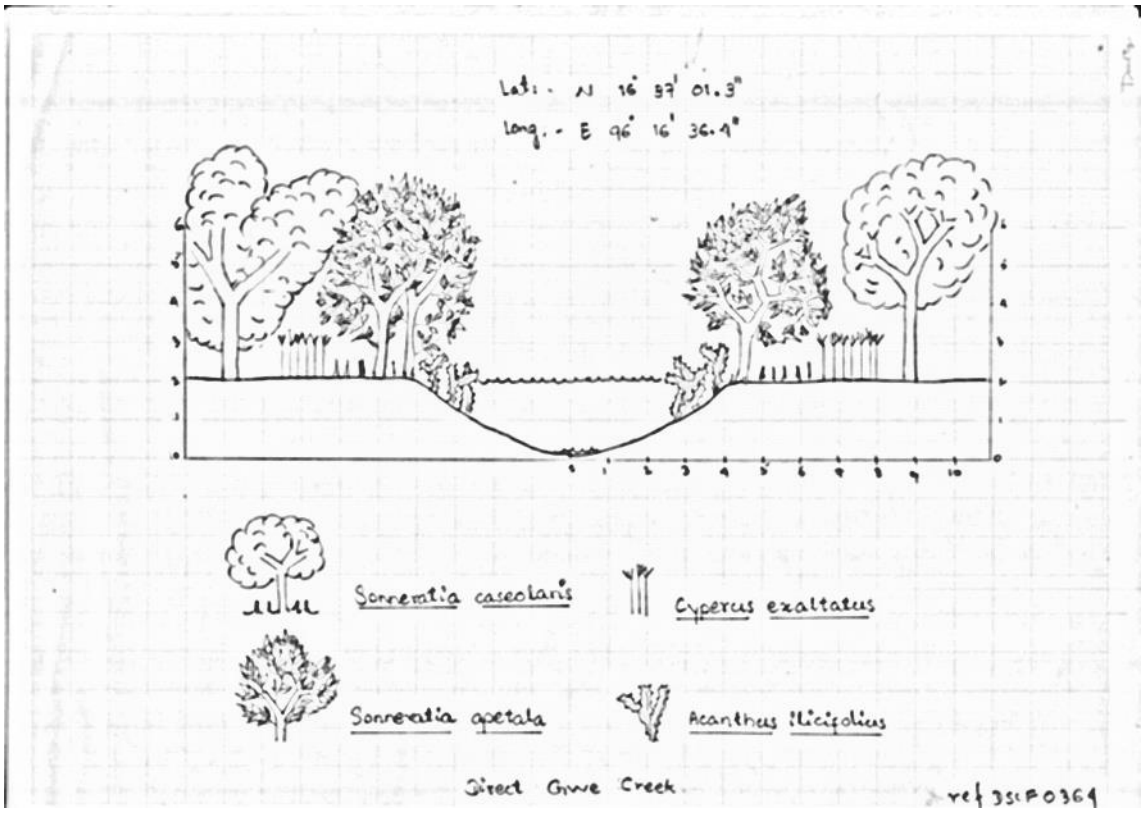
Source: SEZ Management Committee study

Figure 30Direct Kayet Creek Mangrove Profile



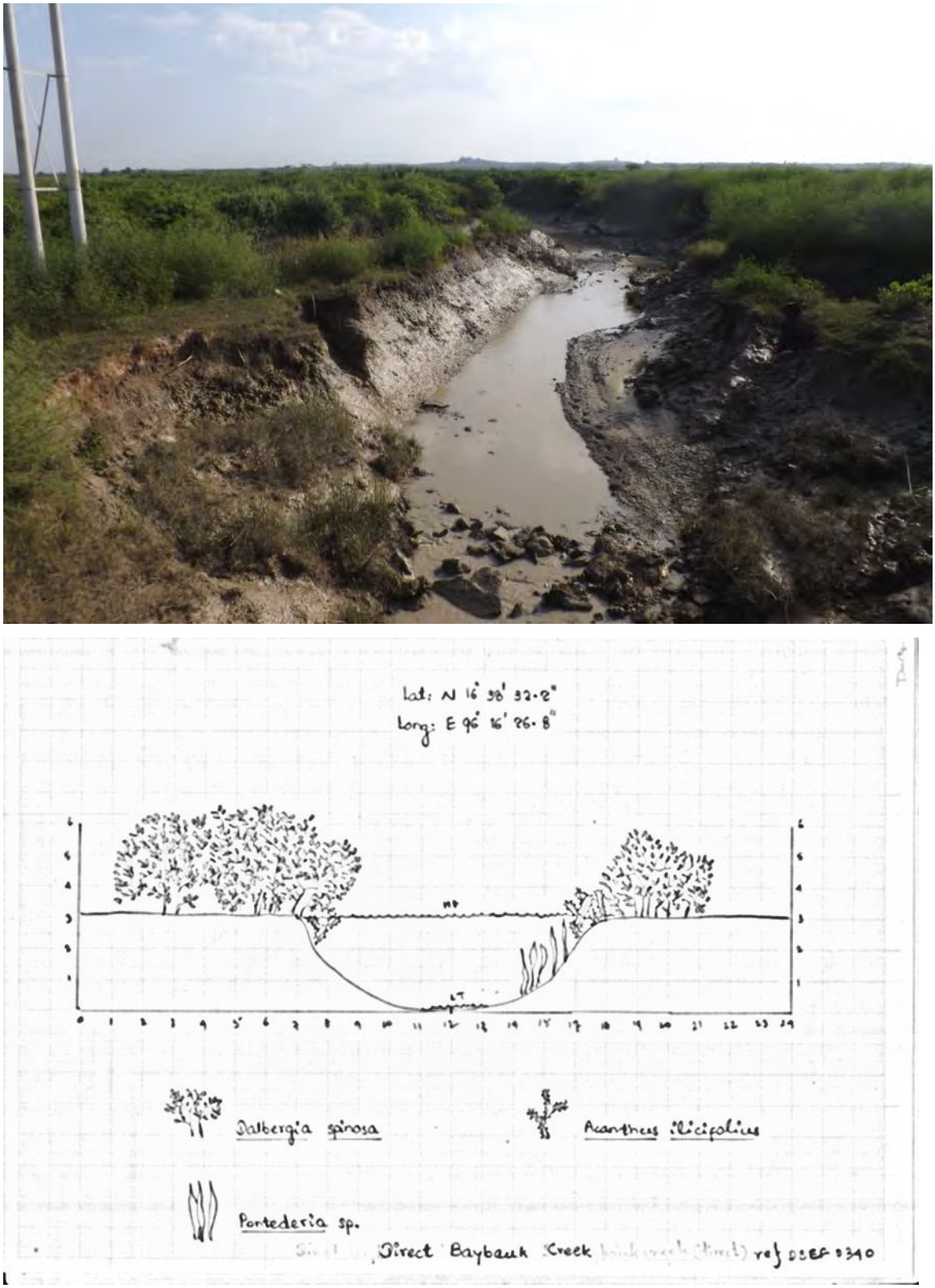
Source: SEZ Management Committee study

Figure 31 Indirect Gwe Creek Mangrove Profile



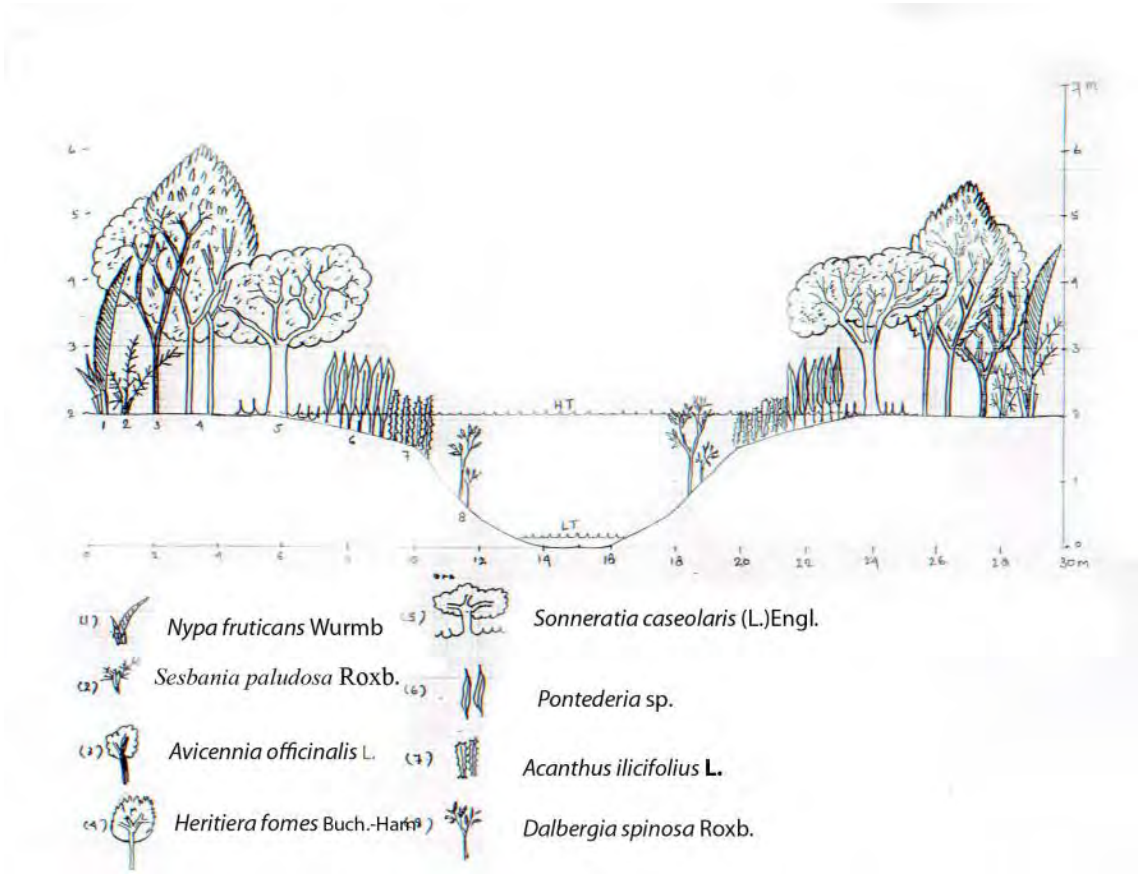
Source: SEZ Management Committee study

Figure 32Direct Gwe Creek Mangrove Profile



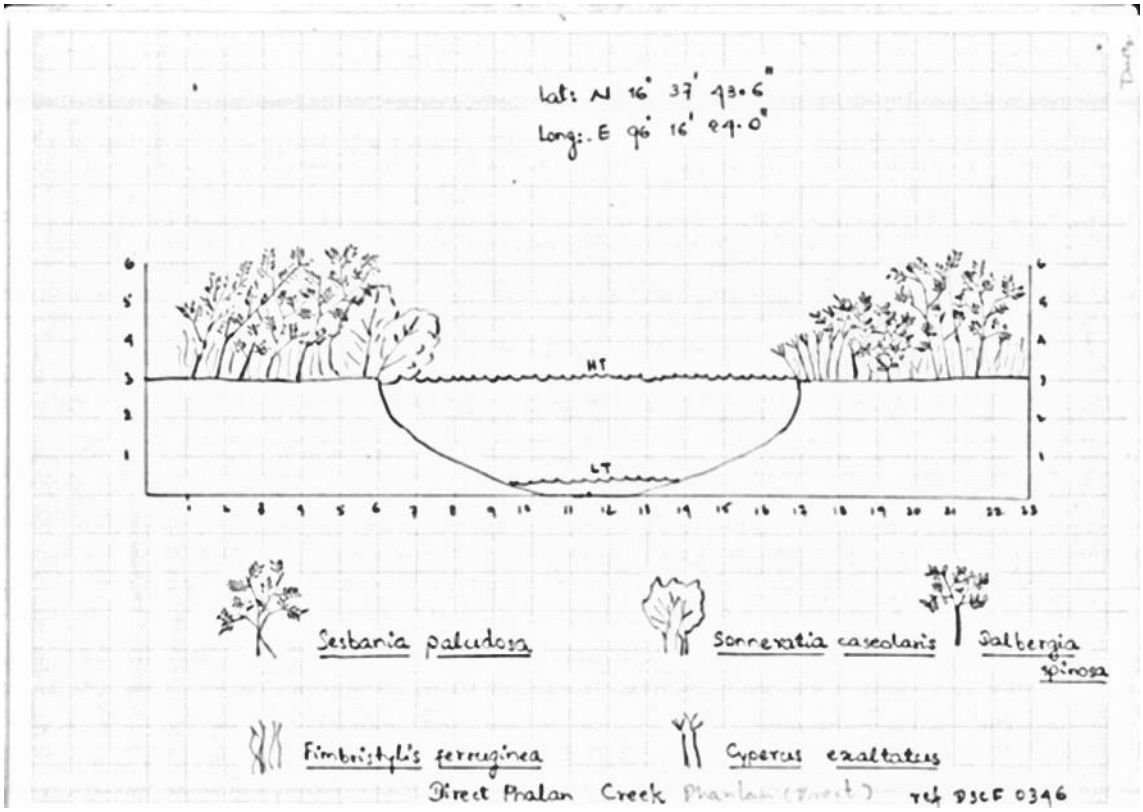
Source: SEZ Management Committee study

Figure 33Direct Baybauk Creek Mangrove Profile



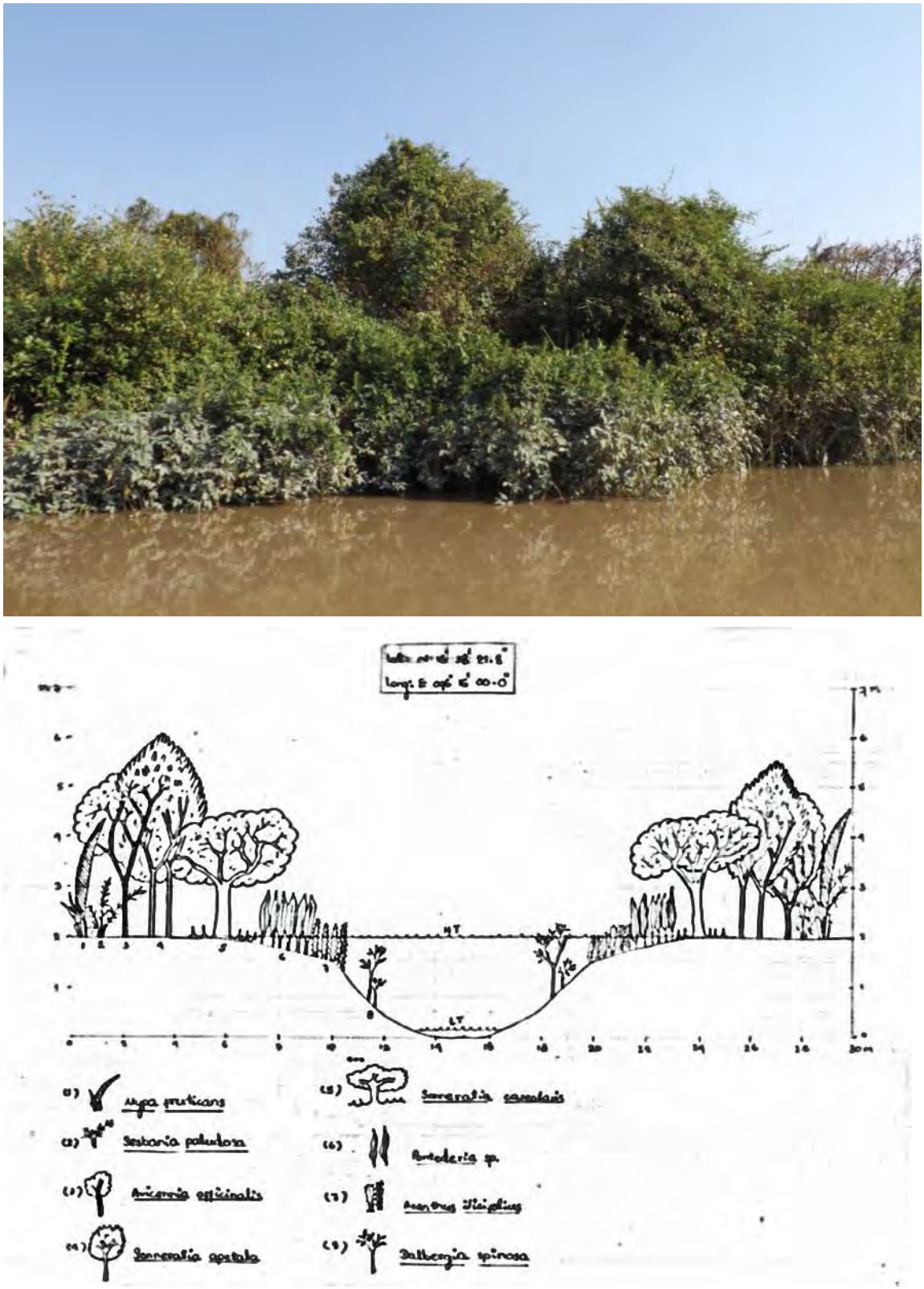
Source: SEZ Management Committee study

Figure 34Indirect Baybauk Creek Mangrove Profile



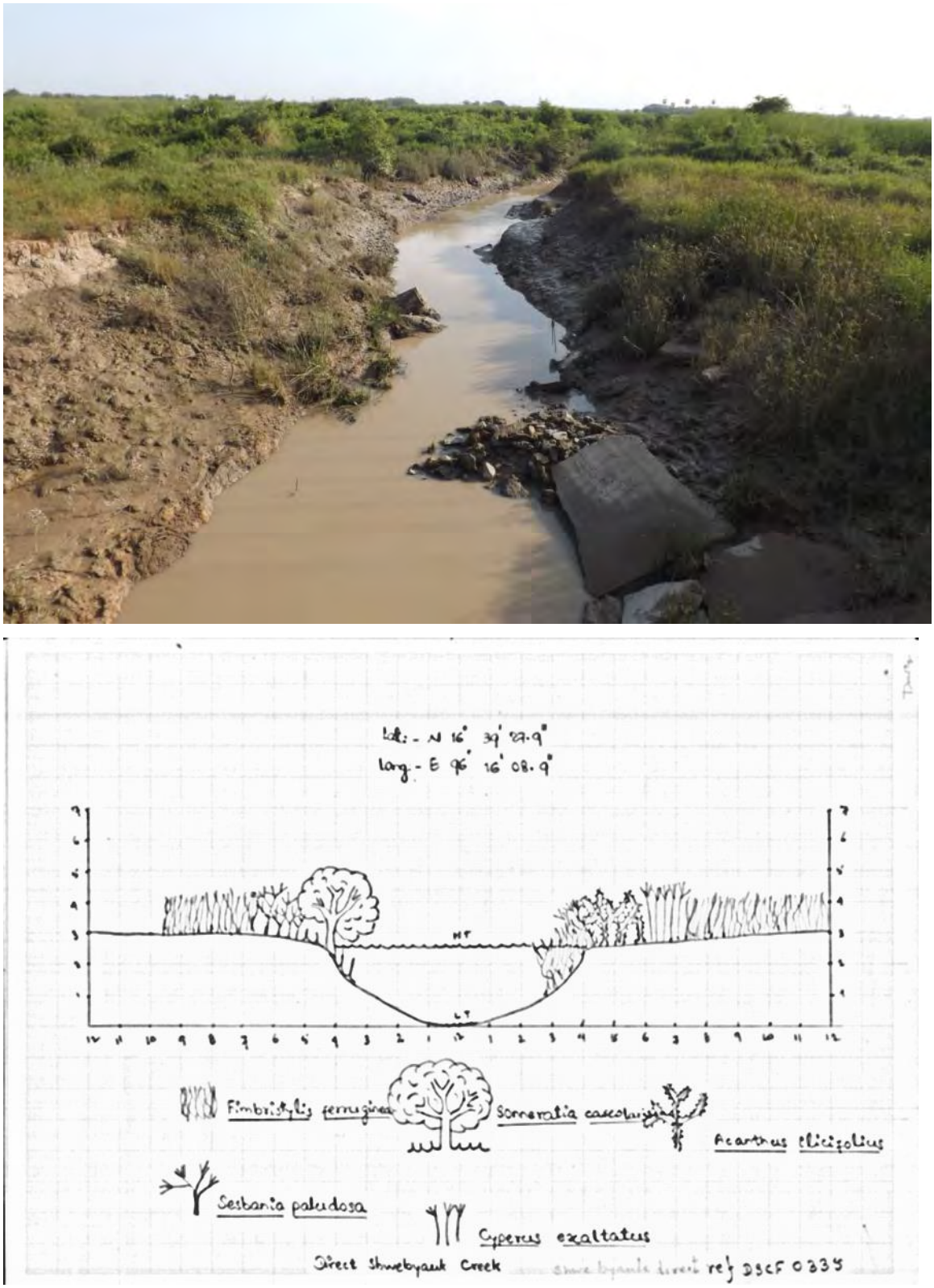
Source: SEZ Management Committee study

Figure 35Direct Phalan Creek Mangrove Profile



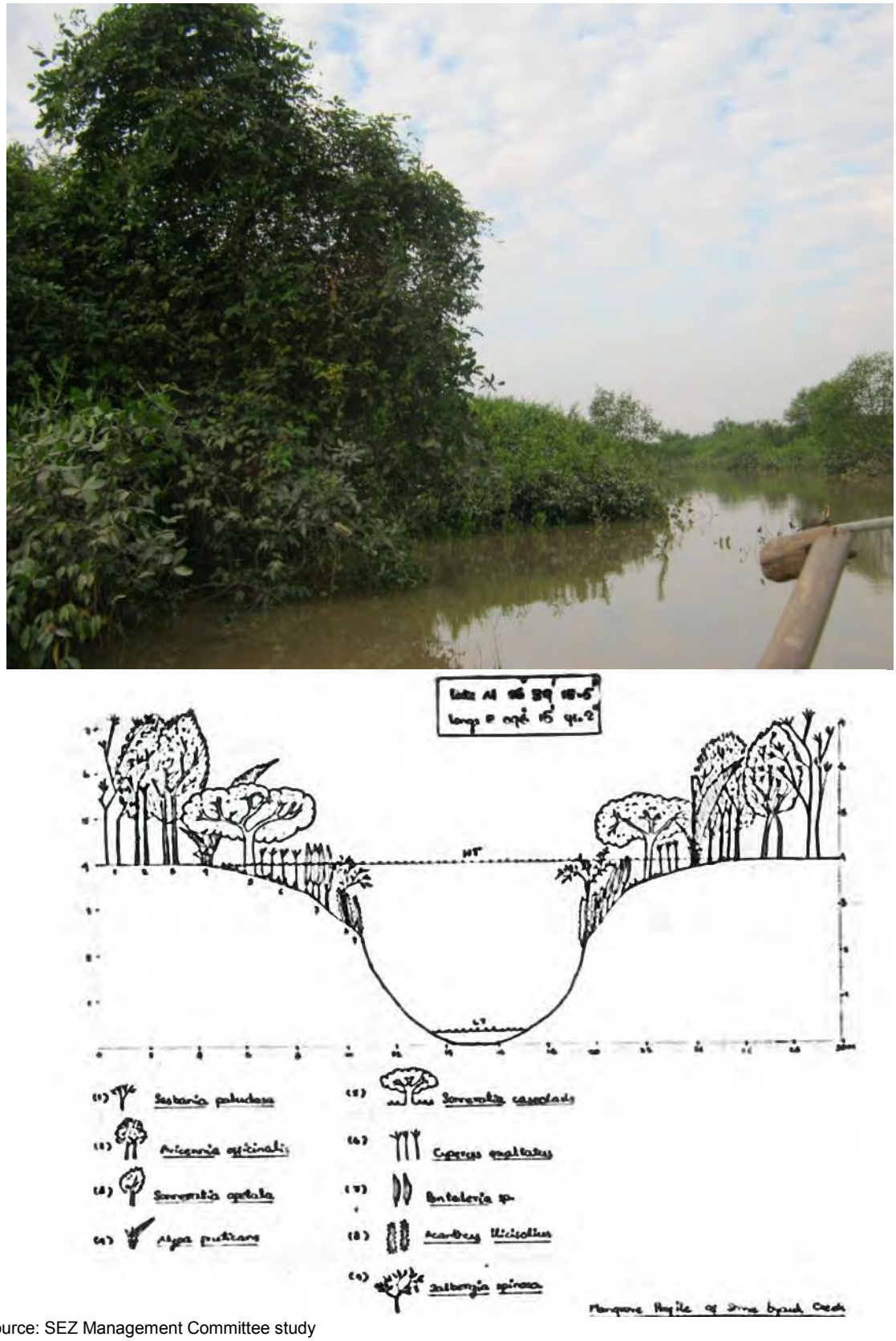
Source: SEZ Management Committee study

Figure 36Indirect Phalan Creek Mangrove Profile



Source: SEZ Management Committee study

Figure 37Direct Shwebyauk Creek Mangrove Profile



Source: SEZ Management Committee study

Figure 38Indirect Shwebyauk Creek Mangrove Profile

4） Fresh Water Ecosystem

The freshwater ecosystem includes the Thilawa Reservoir as well as the freshwater pond near Phalankanoo Monastery.

Source: SEZ Management Committee study

Figure 39Freshwater Ecosystem in Project Area

Table 63 Freshwater Flora Species in Summer Season

	Common Name	Scientific Name	Family Name
1	Bae-da	*Eichhornia crassipes* (Mart.) Solms	Pontederiaceae
2	Bu-baung-pin	*Utricularia* sp.	Lentibulariaceae
3	Bu-baung-pin	*Utricularia uliginosa* Vahl	Lentibulariaceae
4	Bu-baung-pin	*Utricularia aurea* Lour.	Lentibulariaceae
5	Dal grass	*Hymenachne amplexicaulis* (Rudge) Nees	Poaceae
6	Duck weed	*Lemna minor* L.	Lemnaceae
7	Hmo-nato	*Marsilea quardrifoliata* Linn.	Marsileaceae
8	Htika-yone	*Neptunia oleracea* Lour.	Mimosaceae
9	Ka-dauk-set	*Monochoria vaginalis* (Presl) Kunth	Pontederiaceae
10	Ka-na-phaw	*Enhydra fluctuans* Lour.	Asteraceae
11	Kyar-lin-pan	*Nymphoides hydrophylla* Lour.	Menyanthaceae
12	Kyar-ni	*Nymphaea pubescens* Willd.	Nymphaeaceae
13	Kyar-phyu	*Nymphaea tetragona* Georgi	Nymphaeaceae
14	Kyar-pya	*Nymphaea nouchali* Byrn. f.	Nymphaeaceae
15	Le-pa-du	*Sphenoclea zeylanica* Gaertn.	Sphenocleaceae
16	Not known	*Schoenoplectus maritimus* (L.) K. Lye	Cyperaceae
17	Not known	*Azolla pinnata*	Salviniaceae
18	Not known	*Ceratopteris thalictroides*	Pteridaceae
19	Not known	*Gratiola sexdentata*	Scrophulariaceae
20	Not known	*Eriocaulon parkeri*	Eriocaulaceae
21	Not known	*Eriocaulon luzulaefolium* Mart	Eriocaulaceae
22	Not known	*Pontederia* sp.	Pontederiaceae
23	Padon-ma-kya	*Nelumbo nucifera* Gaertn.	Nelumbonaceae
24	Peik-swel	*Typha angustifolia* Chaub.& Bory	Typhaceae

	Common Name	Scientific Name	Family Name
25	Algae	*Spirogyra* sp.	Zygnemataceae
26	Thon-dauk-myat	*Cyperus exaltatus* Retz	Cyperaceae
27	Ye-ka-nyut	*Ludwigia adscendens* (L.) H. Hara	Onagraceae
28	Ye-ka-zun	*Ipomoea aquatica* Forssk.	Convolvulaceae

Source: SEZ Management Committee study

Table 64 Additional Emergent Species in Rainy Season

	Common Name	Scientific Name	Family Name
1	Le-pa-dauk	*Monochoria hastaefolia* Presl	Pontederiaceae
2	Myet	*Eleocharis acicularis*(L.)Roem.& Schult.	Cyperaceae
3	Narrowleaved Pondweeds	*Potamogeton* sp.	Potamogetonaceae
4	Not known	*Calamagrostis canadensis* (Michx.) Beauv.	Poaceae
5	Not known	*Cyperus iria* L.	Cyperaceae
6	Not known	*Cyperus odoratus* L.	Cyperaceae
7	Not known	*Echinochloa muricata*	Poaceae
8	Not known	*Eleocharis* sp.	Cyperaceae
9	Not known	*Eriocaulon willdenovianum*	Eriocaulaceae
10	Not known	*Kyllinga brevifolia* Rottb.	Cyperaceae
11	Pyaung-sa-myet	*Paspalum conjugatum* P.J.Bergius	Poaceae
12	Sin-monnyin-myet	*Fimbristylis dichotoma* (L.)Vahl.	Cyperaceae
13	Tet-pya	*Limnocharis emarginata* H & B.	Butomaceae
14	Ye-hmoke-beda	*Ottelia alismoides* (L.) Pers.	Hydrocharitaceae
15	Ye-za-let	*Pistia stratiotes*	Araceae

Source: SEZ Management Committee study

Table 65 Aquatic Ecosystem Plant Typology Prevalence by Season

	Type of plants	Perennial Species	Additional Annual Species in Rainy Season	Total
1	Algae (A)	1	-	1
2	Aquatic Fern (Aq F)	5	-	5
3	Aquatic Grass (Aq G)	1	3	4
4	Aquatic Herb(Aq H)	22	7	29
5	Bamboo (B)	8	-	8
6	Climber /Creeper(Cl/Cr)	31	3	34
7	Grass (G)	8	-	8
8	Herbs (H)	39	14	53
9	Parasitic Fern (P F)	1	-	1
10	Parasitic Shrub(P S)	1	-	1
11	Shrub (S)	60	6	66
12	Small Tree (ST)	46	1	47
13	Tree (T)	45	-	45
14	Mushroom (M)	-	1	1
	Total species	**268**	**35**	**303**

Source: SEZ Management Committee study

G) Flora Value in Project Area

1） Economic and Livelihood Value

The following table describes the value and usages of flora in the project area.

Table 66 Interview with Local Gardeners and Farmers

Place	Plants used	Use of plant	Location	Value of Flora	Opinions of interviewees
Phalan old village	Hti-yoe, Wa-net, Wa-gauk & Wa-ya	Household construction	N 16° 39' 34.9" E 96° 16' 33.6"	1 plant=1,500kyats	Tree plantations can serve as useful buffers between new developments and living areas.
	Wa-bo,Wa-ya, Wa-net, Malay-sia-padauk & Thi-ho	Household construction, Firewood & family use	N16° 39' 48.9" E 96° 16' 30.1"	1 plant=1,500kyats 1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments

Place	Plants used	Use of plant	Location	Value of Flora	Opinions of interviewees
					and living areas.
	Thi-ho	Family use	N16° 39' 26.4" E 96° 16' 46.1"	Unknown	None
	Wa-net, Wa-gauk , Wa-ya & Thi-ho,	Household construction & family use	N16° 39' 37.2" E 96° 16' 51.3"	1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.
	Malay-sia-padauk	Firewood	N16° 40' 02.4" E 96° 17' 02.2"	1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.
	Malay-sia-padauk	Firewood	N16° 39' 40.8" E 96° 17' 12.9"	1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.
	Thi-ho	Commercial use	N16° 39' 08.3" E 96° 17' 01.8"	1 year=300,000kyats	none
	Malay-sia-padauk	Firewood	N16° 38' 57.3" E 96° 16' 51.1"	1 plant=3,500kyats	Tree plantations can serve as useful buffers between new developments and living areas.
	Malay-sia-padauk	Firewood	N16° 39' 25.2" E 96° 17' 14.5"	1 plant=3,500kyats	Tree plantations can serve as useful buffers between new developments and living areas.
	Malay-sia-padauk	Firewood	N16° 39' 23.4" E 96° 17' 29.4"	1 plant=3,500kyats	Tree plantations can serve as useful buffers between new developments and living areas.
	Bu, May-myo Taing-daung-pe	Commercial use	N16° 39' 52.5" E 96° 17' 19.7"	1 fruit=500kyats 1 plant=80-90kyats 10 fruits=100kyats	none
Thidar myaing village	Wa-ya, Wa-net & Malay-sia-padauk	Household construction & Firewood	N16° 37' 35.8" E 96° 17' 31.6"	1 plant=1,500kyats 1 plant=3,500kyats	Tree plantations can serve as useful buffers between new developments and living areas.
Phalan old village	Wa-net, Wa-gauk , Wa-ya , Thi-ho & Malay-sia-padauk	Household construction, family use & Firewood	N16° 38' 59.7" E 96° 17' 27.1"	1 plant=1,500kyats 1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.
Shwepyi thayar old village	Hti-yoe, Wa-net, Wa-ya & Thi-ho	Household construction & family use	N16° 38' 42.9" E 96° 17' 15.8"	1 plant=1,500kyats	Tree plantations can serve as useful buffers between new developments and living areas.
	Gan-da-mar, Kha-yan Chin-paung-ni Mon-la Kon-ka-zun	Commercial use	N16° 38' 39.1" E 96° 17' 22.6"	1 plant=130kyats 1 viss=500-1,000kyats 10 plants=50kyats 5 plants=200kyats 10 plants=70kyats	none
Letyetsan old village	Wa-net, Wa-gauk , Wa-ya , Thi-ho & Malay-sia-padauk	Household construction, family use & Firewood	N16° 40' 21.9" E 96° 17' 06.1"	1 plant=1,500kyats 1 plant=3.500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.
Thilawa old village	Malaysia-padauk	Firewood	N 16° 40' 08.6 " E 96° 16' 37.6"	1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.

Place	Plants used	Use of plant	Location	Value of Flora	Opinions of interviewees
Alwumsut old village	Malaysia-padauk	Firewood	N 16° 42' 08.4" E 96° 15' 15.7"	1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.
	Malaysia-padauk	Firewood	N 16° 41' 58.0" E 96° 14' 49.3"	1 plant=3,500kyats (7 years)	Tree plantations can serve as useful buffers between new developments and living areas.

Source: SEZ Management Committee study

2） Ecosystem Service Value

The following table provides an estimate of the total CO_2 sequestration in the Project area as a result of monoculture plantations. The total estimated sequestration on site is calculated by total planted acres multiplied by the estimated sequestration in kg/acre, resulting in an estimate of 508,847.6kg or ~508 tons of CO_2.

Table 67 Carbon Sequestration of Monocultural Plantation

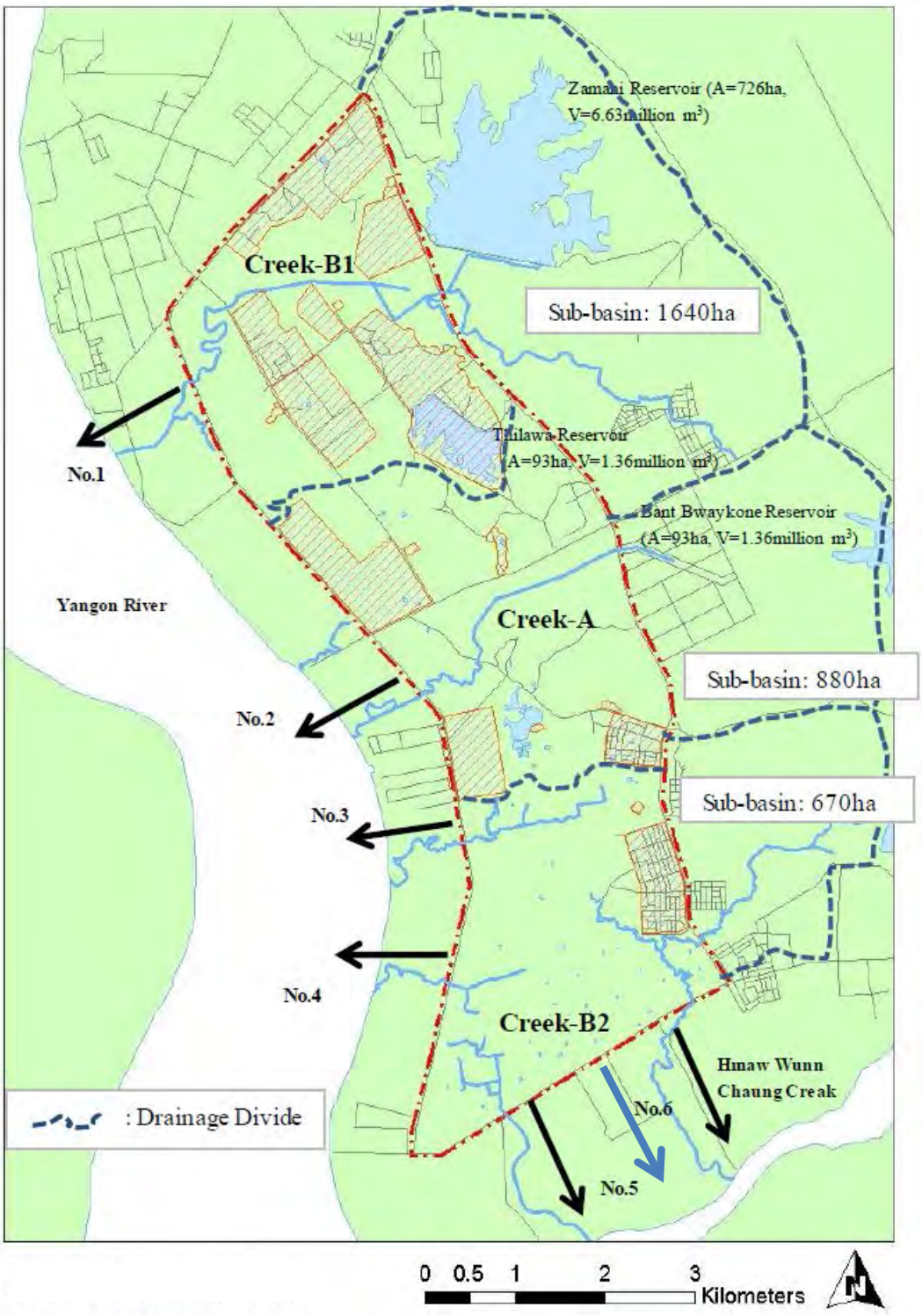
Scientific Name	CO2 sequestration in individual tree	CO_2 Sequestration rate (kg)	No. of tree/acre	Total planted acre	Total CO_2 Sequestration (kg/acre)	Total CO_2 Sequestration (kg)
(9 years old) *Acacia auriculiformis*	0.756	0.084	251.8	20.0	5,036.9	100,737.2
(9 years old) *Acacia auriculiformis*	0.756	0.084	251.8	10.0	2,518.4	25,184.3
(8 years old) *Acacia auriculiformis*	0.474	0.059	177.8	5.0	888.8	4,443.9
(7 years old) *Acacia auriculiformis*	0.704	0.101	301.7	0.4	119.3	47.2
(7 years old) *Acacia auriculiformis*	0.704	0.101	301.7	0.4	119.3	47.2
(7 years old) *Acacia auriculiformis*	0.856	0.122	366.8	5.0	1,834.1	9,170.4
(4 years old) *Acacia auriculiformis*	0.311	0.078	232.9	3.0	698.8	2,096.3
(4 years old) *Acacia auriculiformis*	0.175	0.044	131.0	0.6	80.9	50.0
(4 years old) *Acacia auriculiformis*	0.205	0.051	153.8	0.4	60.8	24.0
Total	**4.939**	**0.723**	**2,169.4**	**44.8**	**11,357.2**	**508,847.6**

Source: SEZ Management Committee study

1.3.5 Hydrology

The two main dynamic water bodies around the SEZ into which water drains are the Yangon River and the Hmawwun River. The main river around the Thilawa SEZ area is the Yangon River, a large tidal river flowing from north to south to the west of the Thilawa SEZ. The much smaller Hmawwun River flows from east to west to the south of the Thilawa SEZ and empties into the Yangon River. The main reservoirs include the Zarmani Dam, just offsite to the north, the Thilawa Dam in the central northern portion of the site adjoining the Class A zone, and the Bant Bway Kone Dam in the central southern portion of the site. The Thilawa SEZ area in its natural state is very low-lying and floods during the rainy season to the point that most non-paved roads are inaccessible by vehicle. Therefore, there are a multitude of rivulets and streams on the site. These flow out into the six main creeks exiting the site: two

exiting southerly into the Hmawwun River and four exiting westerly to the Yangon River. A map of the basins within the area is shown below.



Source: JICA (2013) *Preparatory Study on Thilawa Special Economic Zone (SEZ) Infrastructure Development in the Republic of the Union of Myanmar*

Figure 40 Drainage Catchments of the Project Area Zone

1.3.6 Topography and Geology

The topography of the Project area consists of mostly flat alluvial plan in the western areas

around Kyauktan Township dominated by paddy fields. This alluvial plain area is generally less than 6.6m above sea level. In the rainy season this area floods and is planted with paddy.

The topography changes to the north and west towards Thanlyin area, gradually changing into rolling hills. The highest areas of the Project area lie along the western section of the area along the Thanlyin-Kyauktan Highway and western part of Nyaungwine Village Tract and Shwebyauk Village. The maximum elevation in the Project area is 17m above sea level near the border of Thanlyin and Kyauktan Townships along the road between the Ahle Village of Thanlyin and the Thilawa Village of Kyauktan.

A topographical map of the area is presented in the figure to the right.

Source: SEZ Management Committee

Figure 41 Topographical Map of the Project Area

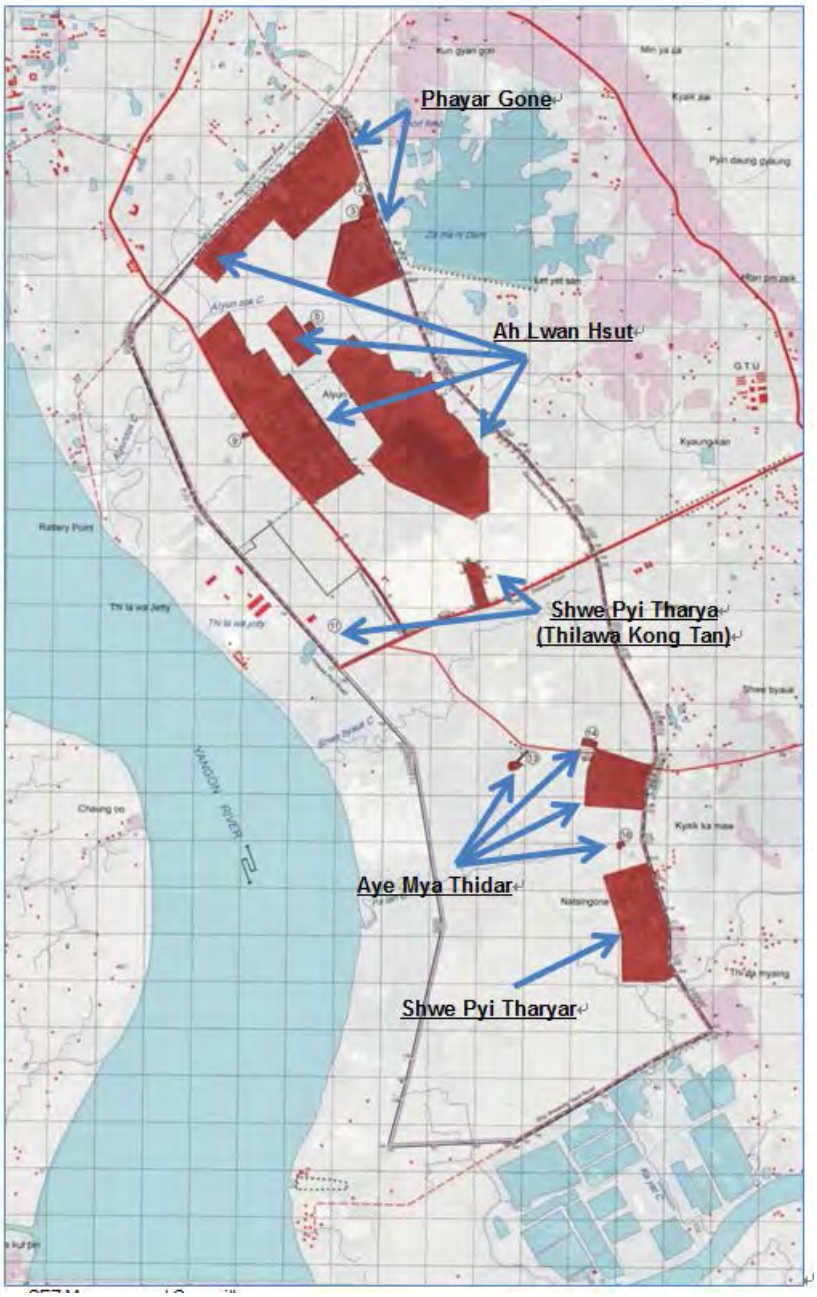
1.4 Social Environment

The Project area is located approximately 20km south of by road or 8km directly. Yangon is the principal commercial and cultural city of Myanmar. Yangon is also the largest city with an estimated 4.259 million people, followed by Mandalay with about 1.009 million people and Naypyidaw (the capital of the country) with 992,000 at the end of 2009. The average national adult literacy is 92.7 percent with a higher percentage among the male population than in the females. The maternal mortality indicators have been gradually improving in recent years. The infant mortality rate (IMR) in 2013 was 47.74 per 1,000 live births.

Thilawa SEZ overlaps both the Thanlyin and Kyauktan Townships south of Yangon with the northern half of the Project in Thanlyin and the southern half in Kyauktan. Thanlyin as a

whole has an area of 143.982mi^2 (372.912km^2) with a population of 210,838 people in 2015. Kyauktan as a whole has an area of 325.76mi^2 (843.715km^2) with a population of 170,844 people in 2015. In the Thilawa SEZ itself, there seems to be a number of households in the 2,000ha area of the SEZ with the highest population density in the northern area of the SEZ zone.[8] Villages in and immediately around the SEZ are labeled in the map below.

[8] JICA (2013b). *Resettlement Work Plan (RWP) for Development of Phase 1 Area Thilawa Special Economic Zone (SEZ)*



Source: SEZ Management Committee

Figure 42Villages In and Around the Thilawa SEZ

Detailed data from the General Administrative Departments of Thanlyin and Kyauktan follow below.

Table 68 Total Population of Thanlyin Township (2015)

Village Tract / Quarter	Village Unit	Houses	Households	Under 18 years			Over 18 years			Total		
				Male	Female	Total	Male	Female	Total	Male	Female	Total
Quarters												
East New Town	-	327	327	126	117	*243*	487	529	*1,016*	613	646	*1,259*
Middle New Town	-	192	192	27	11	*38*	360	456	*816*	387	467	*854*
West New Town	-	100	100	41	26	*67*	172	195	*367*	213	221	*434*
East Old Town	-	2,145	2,185	2,343	1,332	*3,675*	3,230	3,741	*6,971*	463	5,073	*5,536*
Middle Old Town	-	796	98	527	543	*1,070*	1,354	1,594	*2,948*	1,881	2,128	*4,009*
West Old Town	-	720	720	520	483	*1,003*	1,032	1,147	*2,179*	1,552	1,630	*3,182*
South Myo Ma	-	1,151	1,151	340	328	*668*	115	2,213	*2,328*	2,055	2,541	*4,596*
North Myo Ma	-	241	241	129	111	*240*	462	559	*1,021*	591	670	*1,261*
Yae Nan	-	608	608	237	223	*460*	980	106	*1,086*	1,217	1,290	*2,507*
Dar Gar	-	1,004	1,004	552	551	*1,103*	1,591	196	*1,787*	1,243	2,348	*3,591*
Aung Mingalar	-	439	439	107	103	*210*	685	889	*1,574*	792	992	*1,784*
Thaut Taw Kwin	-	1,087	1,087	598	380	*978*	159	214	*373*	2,195	2,527	*4,722*
Oak Pho Su	-	1,039	1,039	563	701	*1,264*	1,736	191	*1,927*	2,299	2,618	*4,917*
A Mhu Htan	-	1,958	2,002	1,251	1,379	*2,630*	3,154	3,561	*6,715*	4,405	4,940	*9,345*
Htan Pin Kone	-	661	661	312	342	*654*	1,261	1,452	*2,713*	1,573	1,794	*3,367*
Pago Su	-	1,044	1,044	361	524	*885*	1,754	2,070	*3,824*	2,115	2,594	*4,709*
Aung Chan Thar	-	1,532	1,550	527	884	*1,411*	3,375	3,924	*7,299*	3,902	4,808	*8,710*
	Total of 17 Quarters	***15,044***	***14,448***	***8,561***	***8,038***	***16,599***	***21,907***	***23,037***	***44,944***	***27,496***	***37,287***	***64,783***
Village Tracts												
Win Kanei	-	277	286	150	196	*346*	413	450	*863*	563	646	*1,209*
East Pharku	-	1,015	1,030	576	508	*1,084*	1,517	1,566	*3,083*	2,093	2,110	*4,203*
West Pharku	-	498	498	300	306	*606*	705	791	*1,496*	1,005	1,097	*2,102*
Bot Tha Pyay Kan	-	1,003	1,003	654	692	*1,346*	1,428	1,523	*2,951*	2,082	2,215	*4,297*
Kayin Sate	-	787	802	570	556	*1,126*	1,236	1,288	*2,524*	1,806	1,844	*3,650*
Tha Pyay Kone	-	682	683	289	357	*646*	929	964	*1,893*	1,218	1,321	*2,539*
Ah Lwan Sut	-	1,169	1,179	793	728	*1,521*	1,698	1,979	*3,677*	2,491	2,707	*5,198*
Kyaung Kone Sate Gyi	-	1,059	1,090	912	1,045	*1,957*	6,413	2,204	*8,617*	7,323	3,249	*10,572*
Tha Htay Kwin	-	519	519	380	401	*781*	784	883	*1,667*	1,164	1,284	*2,448*
Sit Pin Kwin	-	563	563	283	298	*581*	842	834	*1,676*	1,125	1,132	*2,257*
Bayat	-	353	353	197	274	*471*	485	518	*1,003*	682	792	*1,474*
Ngar Pyay Ma	-	418	418	266	282	*548*	636	653	*1,289*	902	935	*1,837*
Nga/ Pa	-	466	473	395	389	*784*	752	746	*1,498*	1,147	1,153	*2,300*
Thana Pin	-	162	162	116	133	*249*	227	232	*459*	343	365	*708*
Nyaung Thone Pin	-	1,379	1,446	923	1,094	*2,017*	2,909	3,371	*6,280*	3,832	4,465	*8,297*
Yone Tha Pyay Kan	Yone Thapyay Kan	568	568	357	349	*706*	827	853	*1,680*	1,184	1,202	*2,386*
	Lat Pan	96	95	130	80	*210*	178	254	*432*	308	334	*642*
	Total	*664*	*663*	*487*	*429*	*916*	*1,005*	*1,107*	*2,112*	*1,492*	*1,536*	*3,028*
Daezart	Daezart	350	350	165	148	*313*	320	344	*664*	485	492	*977*
	Kankyisu	152	152	34	19	*53*	59	78	*137*	93	97	*190*
	KanHla-Kalartan	110	110	77	67	*144*	159	156	*315*	236	223	*459*
	Uyinkone	183	183	89	74	*163*	241	274	*515*	330	348	*678*

Village Tract / Quarter	Village Unit	Houses	Households	Under 18 years			Over 18 years			Total		
				Male	Female	Total	Male	Female	Total	Male	Female	Total
	Total	*795*	*795*	*365*	*308*	*673*	*779*	*852*	*1,631*	*1,144*	*1,160*	*2,304*
Mingalon	Mingalon	465	465	330	326	*656*	881	933	*1,814*	1,211	1,259	*2,470*
	Pauktaw	192	192	123	135	*258*	150	150	*300*	273	285	*558*
	Nyaungwine	178	178	123	135	*258*	150	150	*300*	273	285	*558*
	Total	*835*	*835*	*576*	*596*	*1,172*	*1,181*	*1,233*	*2,414*	*1,757*	*1,829*	*3,586*
Bagantaung	Bagantaung	514	514	164	170	*334*	616	671	*1,287*	780	841	*1,621*
	Ywarthit	283	283	169	254	*423*	234	169	*403*	403	423	*826*
	Total	*797*	*797*	*333*	*424*	*757*	*850*	*840*	*1,690*	*1,183*	*1,264*	*2,447*
Bogyoke	Bogyoke	1,531	1,537	1,561	1,102	*2,663*	2,039	2,539	*4,578*	3,600	3,641	*7,241*
	Ywarthit	1,302	1,307	806	1,135	*1,941*	2,363	2,597	*4,960*	3,169	3,732	*6,901*
	Tharyarkone	717	721	786	702	*1,488*	707	802	*1,509*	1,493	1,504	*2,997*
	Total	*3,550*	*3,565*	*3,153*	*2,939*	*6,092*	*5,109*	*5,938*	*11,047*	*8,262*	*8,877*	*17,139*
Laharyet	Laharyet	431	341	165	189	*354*	422	485	*907*	587	674	*1,261*
	Tharyarkone	201	167	132	95	*227*	215	247	*462*	347	342	*689*
	Total	*632*	*508*	*297*	*284*	*581*	*637*	*732*	*1,369*	*934*	*1,016*	*1,950*
Kadatphyar	Kadatphyar	252	150	87	83	*170*	245	242	*487*	332	325	*657*
	Pyitawthar	125	70	51	50	*101*	31	83	*114*	82	133	*215*
	Sikone	315	153	109	103	*212*	207	225	*432*	316	328	*644*
	Total	*692*	*373*	*247*	*236*	*483*	*483*	*550*	*1,033*	*730*	*786*	*1,516*
Nyaunglaypin	Nyaunglaypin	347	347	109	234	*343*	460	466	*926*	569	700	*1,269*
	Kantharmyint	100	100	192	61	*253*	135	189	*324*	327	250	*577*
	Total	*447*	*447*	*301*	*295*	*596*	*595*	*655*	*1,250*	*896*	*950*	*1,846*
Kalarwae	Kalarwae	496	486	322	353	*675*	695	667	*1,362*	1,017	1,020	*2,037*
	Htawthwin	135	130	67	98	*165*	231	262	*493*	298	360	*658*
	Total	*631*	*616*	*389*	*451*	*840*	*926*	*929*	*1,855*	*1,315*	*1,380*	*2,695*
Letyetsan	Letyetsan	605	592	491	598	*1,089*	1,270	1,342	*2,612*	1,761	1,940	*3,701*
	Pyinhtaungkyaung	425	428	417	385	*802*	601	542	*1,143*	1,018	927	*1,945*
	Htanpinseik	681	681	545	504	*1,049*	1,039	951	*1,990*	1,584	1,455	*3,039*
	KyeikInn	238	238	251	203	*454*	360	308	*668*	611	511	*1,122*
	Kyaungkankwin	301	301	370	233	*603*	370	333	*703*	740	566	*1,306*
	Alaeywar	598	598	416	364	*780*	927	778	*1,705*	1,343	1,142	*2,485*
	Myayaryoe	1,392	1,392	603	577	*1,180*	1,720	2,216	*3,936*	2,323	2,793	*5,116*
	Htarmalon	1,397	1,397	713	740	*1,453*	1,948	1,696	*3,644*	2,661	1,586	*4,247*
	Total	*5,637*	*5,627*	*3,806*	*3,604*	*7,410*	*8,235*	*8,166*	*16,401*	*12,041*	*10,920*	*22,961*
Saylonekyi	-	258	259	198	147	*345*	367	415	*782*	565	562	*1,127*
Chaungsauk	-	246	242	147	137	*284*	410	540	*950*	557	677	*1,234*
Phayarkone	Phayarkone	1,472	2,281	1,704	867	*2,571*	2,988	4,437	*7,425*	4,692	5,304	*9,996*
	Kyeik Inn	374	309	198	93	*291*	822	814	*1,636*	1,020	907	*1,927*
	Kwinchankone	1,371	1,270	265	272	*537*	1,833	1,919	*3,752*	2,098	2,191	*4,289*
	Kyaukyaetwin	1,064	1,064	290	310	*600*	1,519	1,565	*3,084*	1,809	1,875	*3,684*
	Natsinkone	288	213	128	48	*176*	694	657	*1,351*	822	705	*1,527*
	Thaephyuchaung	780	680	185	54	*239*	1,226	1,236	*2,462*	1,411	1,290	*2,701*
	Kanyinpin	1,062	1,093	457	363	*820*	979	1,056	*2,035*	1,436	1,419	*2,855*
	Letyetsan	634	558	171	117	*288*	510	1,226	*1,736*	681	1,343	*2,024*

Village Tract / Quarter	Village Unit	Houses	Households	Under 18 years			Over 18 years			Total		
				Male	Female	Total	Male	Female	Total	Male	Female	Total
	Batonesan	386	436	176	202	*378*	699	1,051	*1,750*	875	1,253	*2,128*
	Total	*7,431*	*7,904*	*3,574*	*2,326*	*5,900*	*11,270*	*13,961*	*25,231*	*14,844*	*16,287*	*31,131*
	Total of 28 Village Tracts	***32,965***	***33,136***	***20,677***	***19,435***	***40,112***	***52,821***	***53,920***	***106,741***	***73,496***	***72,559***	***146,055***
	Total Township Population	**48,009**	**47,584**	**29,238**	**27,473**	**56,711**	**74,728**	**76,957**	**151,685**	**100,992**	**109,846**	**210,838**

Source: General Administrative Department, Thanlyin

Table 69 Total Population of Kyauktan Township (2015)

Village Tract / Quarter	Village Unit	Houses	Households	Under 18 years			Over 18 years			Total		
				Male	Female	Total	Male	Female	Total	Male	Female	Total
Quarter												
Eastern Quarter	-	564	642	371	339	710	988	1,021	2,009	1,359	1,360	2,719
Middle Quarter	-	152	256	75	84	159	549	577	1,126	624	661	1,285
Western Quarter	-	720	1,088	587	615	1,202	1,396	1,657	3,053	1,983	2,272	4,255
Ywe Kone Quarter	-	1,797	1,930	969	937	1,906	2,837	3,306	6,143	3,806	4,243	8,049
Sin Kan Quarter	-	1,234	1,366	633	631	1,264	1,951	2,305	4,256	2,584	2,936	5,520
San Chane Mhe Quarter	-	1,265	1,388	685	665	1,350	1,888	2,264	4,152	2,573	2,929	5,502
Thida Myaing Quarter	-	469	563	259	315	574	707	805	1,512	966	1,120	2,086
Aye Mya Thida Quarter	-	279	314	179	176	355	385	430	815	564	606	1,170
Shwe Pyi Thar Quarter	-	698	716	540	480	1,020	1,010	1,012	2,022	1,550	1,492	3,042
No (1) Quarter	-	497	540	282	225	507	731	835	1,566	1,013	1,060	2,073
No (2) Quarter	-	600	744	335	276	611	1,053	1,276	2,329	1,388	1,552	2,940
No (3) Quarter	-	468	513	236	210	446	706	760	1,466	942	970	1,912
No (4) Quarter	-	606	856	426	428	854	1,055	803	1,858	1,481	1,231	2,712
	Total of 13 Quarters	***9,349***	***10,916***	***5,577***	***5,381***	***10,958***	***15,256***	***17,051***	***32,307***	***20,833***	***22,432***	***43,265***
Village Tracts												
Nyaung Wine Village Tract	Nyaung Wine	307	334	203	188	391	427	467	894	630	655	1,285
	Myaing Thar Yar	1,230	1,311	778	790	1,568	1,623	1,798	3,421	2,401	2,588	4,989
	Shansu	267	282	231	187	418	303	327	630	534	514	1,048
	Total	*1,804*	*1,927*	*1,212*	*1,165*	*2,377*	*2,353*	*2,592*	*4,945*	*3,565*	*3,757*	*7,322*
Kyar Kan Village Tract	Kyar Kan	499	508	309	283	592	610	656	1,266	919	939	1,858
Yay Kyaw Village Tract	Yay Kyaw	178	188	84	79	163	218	227	445	302	306	608
	Chaung Sauk	527	568	310	296	606	740	808	1,548	1,050	1,104	2,154
	Total	*705*	*756*	*394*	*375*	*769*	*958*	*1,035*	*1,993*	*1,352*	*1,410*	*2,762*
Shwe Pyauk Village Tract	Shwe Pyauk	310	315	172	163	335	365	410	775	537	573	1,110
	A Dwut Taw	514	516	248	274	522	606	660	1,266	854	934	1,788
	Kyaik Ka Mawt	95	99	52	45	97	125	139	264	177	184	361
	Kyar Kan Date	32	35	15	22	37	42	53	95	57	25	132
	Say Bo Wa	290	291	169	150	319	486	516	1,002	655	666	1,321
	Thein Kone	-	-	-	-	-	-	-	-	-	-	-
	Total	*1,241*	*1,256*	*656*	*654*	*1,310*	*1,624*	*1,778*	*3,402*	*2,280*	*2,382*	*4,712*
Bawga Lut Village Tract	Bawga Lut	294	330	145	127	272	529	512	1,041	674	639	1,313
	Kha Mal	116	128	118	98	216	142	146	288	260	244	504
	Total	*410*	*458*	*263*	*225*	*488*	*671*	*658*	*1,329*	*934*	*883*	*1,817*

Village Tract / Quarter	Village Unit	Houses	Households	Under 18 years			Over 18 years			Total		
				Male	Female	Total	Male	Female	Total	Male	Female	Total
Par Da Gyi Village Tract	Par Da Gyi	431	410	93	96	189	497	486	983	590	582	1,172
	Say Bo Wa	76	78	59	85	144	150	203	353	209	288	497
	Zin Byun Kone	46	59	48	61	107	360	431	791	408	492	900
	Total	*553*	*547*	*200*	*242*	*440*	*1,007*	*1,120*	*2,127*	*1,207*	*1,362*	*2,569*
Chaung wa Village Tract	Chaung Wa	550	608	327	315	642	814	805	1,619	1,141	1,120	2,261
Thanapin Chin Village Tract	Thanapin Chin	102	105	71	79	150	208	198	406	279	277	556
	A Ngu	211	234	124	132	256	341	387	728	465	519	984
	Mway Pway Kone	52	45	34	40	74	71	74	145	105	114	219
	Total	*365*	*384*	*229*	*251*	*480*	*620*	*659*	*1,279*	*849*	*910*	*1,759*
Mee Pya Village Tract	Mee Pya	1,102	1,290	706	723	1,429	1,401	1,311	2,712	2,107	2,034	4,141
	Ka Lout Swae	305	374	432	517	949	883	878	1,761	1,315	1,395	2,710
	Total	*1,407*	*1,664*	*1,138*	*1,240*	*2,378*	*2,284*	*2,189*	*4,473*	*3,422*	*3,429*	*6,851*
Zwe Bar Kone Tan Village Tract	Zwe Bar Kone Tan	623	646	373	386	759	893	956	1,849	1,266	1,342	2,608
Kwa Nee Village Tract	Kwa Nee	620	636	335	300	632	964	1,060	2,024	1,291	130	2,661
Ywa Thit Gyi Village Tract	Ywa Thit Gyi	350	362	267	279	546	560	554	1,114	827	833	1,660
Kyan Pin Village Tract	Kyan Pin	426	432	279	261	540	639	674	1,313	918	935	1,853
Thaung gyi Village Tract	Thaung Gyi	192	210	75	102	177	292	312	604	367	414	781
U Yin Village Tract	U Yin	445	462	228	247	475	630	670	1,300	858	917	1,775
Wae Gyi Village Tract	Wae Gyi	237	313	191	262	453	419	450	869	610	712	1,322
	Kwin Pout	130	201	70	69	139	370	310	680	440	379	819
	Nyaung wie Lay	83	159	139	70	209	275	295	570	414	365	779
	Total	*450*	*673*	*400*	*401*	*801*	*1,064*	*1,055*	*2,119*	*1,464*	*1,456*	*2,920*
Pan Taw Village Tract	Pan Taw	681	722	386	384	770	989	1,052	2,041	1,375	1,436	2,811
	Kyun Ka Lay	345	390	207	210	417	438	495	933	645	705	1,350
	Total	*1,026*	*1,112*	*593*	*594*	*1,187*	*1,427*	*1,547*	*2,974*	*2,020*	*2,141*	*4,161*
Kyone Kan Village Tract	Kyone Kan	425	581	267	275	542	780	808	1,588	1,047	1,083	2,130
Kan Pyaung Village Tract	Kan Pyaung	600	636	475	367	842	937	966	1,903	1,412	1,333	2,745
	Pyin makan	50	151	107	108	215	198	225	423	306	332	638
	Total	*650*	*787*	*582*	*475*	*1,057*	*1,135*	*1,191*	*2,326*	*1,718*	*1,665*	*3,383*
Pi Lakhat Village Tract	Pi Lakhat	101	135	39	38	77	95	243	338	134	281	415
	Kalar Pi lakhat	83	139	89	104	193	60	136	196	149	240	389
	Taman Gyi	68	99	115	150	265	79	118	197	194	268	462
	Total	*252*	*373*	*243*	*292*	*535*	*234*	*497*	*731*	*477*	*789*	*1,266*
Ywar Thit Kalay Village Tract	Ywar Thit Kalay	420	430	330	345	675	390	430	820	720	775	1,495
	Sandi	175	180	68	120	188	312	326	638	380	446	826
	Kyar Kan	168	176	20	51	71	372	340	712	392	391	783
	Total	*763*	*786*	*418*	*516*	*934*	*1,074*	*1,096*	*2,170*	*1,492*	*1,612*	*3,104*
Kayin Chaung Village Tract	Kayin Chaung	288	289	204	206	410	572	476	1,048	776	62	1,458
Kamar Kalote Village Tract	Kamar Kalote	513	526	532	398	930	871	1,103	194	1,403	1,501	2,904
	Kamar Kalote(N)	499	501	189	317	502	816	670	1,486	1,001	987	1,988
	Kamar Lane	258	250	51	107	158	66	154	220	117	261	378
	Paung	1,203	1,310	768	822	1,590	1,753	1,927	3,680	2,521	2,749	5,270
	Total	*2,473*	*2,587*	*1,540*	*1,644*	*3,180*	*3,506*	*3,854*	*5,580*	*5,042*	*5,498*	*10,540*
Kalar Tan Village Tract	Kalar Tan	406	420	301	300	601	429	409	838	730	709	1,439

Village Tract / Quarter	Village Unit	Houses	Households	Under 18 years			Over 18 years			Total		
				Male	Female	Total	Male	Female	Total	Male	Female	Total
	Shwe Pyi Thit	136	146	86	137	223	290	202	492	376	339	715
	Than Tae	101	111	52	27	79	208	193	401	260	220	480
	Taw Ka Lote	106	125	258	95	353	296	388	684	554	483	1,037
	Total	*749*	*802*	*697*	*559*	*1,256*	*1,223*	*1,192*	*2,415*	*1,920*	*1,751*	*3,671*
A Se Village Tract	A Se	432	669	381	361	742	959	1,030	1,989	1,340	1,391	2,731
Mingalon Village Tract	Minga Lon	959	1,101	408	357	765	1,503	1,673	3,176	1,911	2,030	3,941
	Aye Chan Thar	121	351	445	366	811	701	682	1,383	1,146	1,048	2,194
	Total	*1,080*	*1,452*	*853*	*723*	*1,576*	*2,204*	*2,355*	*4,559*	*3,057*	*3,078*	*6,135*
Kanaung Village Tract	Kanaung(East)	304	320	275	182	457	556	638	1,194	831	820	1,651
	Bon Lon	121	280	21	120	141	290	237	527	311	357	668
	Kanaung(west)	289	317	267	173	440	453	468	921	720	641	1,361
	Total	*714*	*917*	*563*	*475*	*1,038*	*1,299*	*1,343*	*2,642*	*1,862*	*1,818*	*3,680*
Mya Kaing Village Tract	Mya kaing	752	792	341	384	725	1,099	1,200	2,299	1,440	1,584	3,024
	Kyone Chike	145	147	123	94	317	200	177	377	423	271	694
	Total	*897*	*939*	*464*	*478*	*1,042*	*1,299*	*1,377*	*2,676*	*1,863*	*1,855*	*3,718*
Zwekana Village Tract	Zwekana	452	482	311	316	627	710	683	1,393	1,021	999	2,020
Boeba Villager Tract	Boeba	300	300	185	205	390	497	527	1,024	682	732	1,414
	Mote Soe Sape	63	84	99	121	220	41	46	87	140	167	307
	Total	*363*	*384*	*284*	*326*	*610*	*538*	*573*	*1,111*	*822*	*899*	*1,721*
Naywechaung Village Tract	Naywechaung	399	487	313	281	594	672	709	1,381	985	990	1,975
Sitta Pin Village Tract	Sitta Pin	55	123	42	44	86	209	180	389	251	224	475
Sittan Village Tract	Sittan	923	1,074	573	563	1,136	1,302	1,380	2,682	1,875	1,943	3,818
Tamankyi Kone Village Tract	Tamankyi Kone	715	729	378	437	815	911	861	1,772	1,289	1,298	2,587
Tumyaung Village Tract	Tumyaung	260	306	125	103	228	391	380	771	516	483	999
Tapa Village Tract	Tapa	525	530	220	211	431	510	590	1,100	730	801	1,531
	Ziphyu Pin	140	151	87	54	141	284	294	578	371	348	719
	Total	*665*	*681*	*307*	*265*	*572*	*794*	*884*	*1,678*	*1,101*	*1,149*	*2,250*
Win Kyi Village Tract	Win Kyi	300	382	272	274	546	604	628	1,232	876	902	1,778
Kadadpana Village Tract	Kadadpana	323	448	236	136	372	773	774	1,547	1,009	910	1,919
Mayanbay Village Tract	Mayanbay	179	210	91	96	187	309	332	641	400	428	828
	Ah Wa Kauk	210	262	104	106	210	321	352	673	425	458	883
	Thu Kha Aung	63	73	39	39	78	86	86	172	125	125	250
	Aungdaphay	167	264	143	112	255	326	326	652	469	438	907
	Total	*619*	*809*	*377*	*353*	*730*	*1,042*	*1,096*	*2,138*	*1,419*	*1,449*	*2,868*
Sinmakaw Village	Sinmakaw	160	381	247	261	508	552	545	1,097	799	806	1,605
Aungchanthar Village	Aungchanthar	400	427	238	203	441	531	538	1,069	769	741	1,510
Shanchaung Village	Shanchaung	689	695	369	371	740	873	866	1,739	1,242	1,237	2,479
Potetalote Village	Potetalote	998	1,054	789	782	1,571	1,370	1,493	2,863	2,159	2,275	4,434
Panchaung Village	Panchaung	263	269	144	130	274	311	390	701	455	520	975
	Total of 54 Village Tracts	***28,425***	***32,036***	***18,806***	***18,485***	***37,382***	***43,988***	***46,202***	***88,410***	***62,883***	***62,786***	***127,579***
	Total Township Population	***37,774***	***42,952***	***24,383***	***23,866***	***48,340***	***59,244***	***63,253***	***120,717***	***83,716***	***85,218***	***170,844***

Source: General Administrative Department, Kyauktan

1.4.1 Historical Context

The area in question is Thilawa, reportedly established first as a village in the early 1700s. Thilawa is a part of the greater Thanlyin (also called Syriam) and Kyauktan townships that in turn need to be considered in the regional context. The majority of the immediate region's historical area is a rough circle ranging from present day Bago to Yangon and down to the Gulf of Martaban on either side of the Yangon River.

There is considerable doubt as to the history of the region before the 16th century. It is probably likely that various Buddhist settlers with links to areas in the present day India were present in the area since before the Common Era. These settlers are associated with the ancient Pada Kingdom, where there are at present day laterite remains around the Pardagyi Pagoda. However, there is very little known about this Kingdom. Local legends first begin in 514 AD with the foundation of the Mon-speaking Hanthawaddy Kingdom in Pegu, which lasted as a collection of Buddhist and Hindu states until 1050 AD when governors were appointed from the Bamar Pagan empire. The last of these governors rebelled against the Pagan rule successfully in 1287 AD after collapse of the Bagan to the Mongols resulting in the re-establishment of Pegu as a state in its own right as the first Peguan empire. Under this rule, the first Peguan Empire consolidated Mon rule over a wide area including the Hanthawaddy Kingdom and Martaban and Bassein, two other nearby kingdoms. This empire was overthrown in 1540 AD with the succession of the Toungoo Dynasty (the second Peguan Empire). During the Toungoo Dynasty, Syriam became an increasingly important center for commerce.

As a historical anecdote in the context of the Syriam, the short-lived fortress of Portuguese adventurer/mercenary Filipe de Brito e Nicote ("Nga Zinga") is well remembered in modern times. Along with Rakhine forces under the King of Arakan Min Razagri, de Brito was given Syriam by the King as recompense for his loyalty as a mercenary and in 1603 and became de facto ruler of the Syriam town around present-day Thanlyin where he attempted to establish a base for further Portuguese influence in Lower Myanmar. In 1613 he was defeated by forces from Pegu and executed.

By 1740, the Toungoo Dynasty had (re-)conquered all of Pegu and its kingdoms. By this time, Syriam was the main trading city due to silted up ports at Pegu. The Burmese armies successfully defeated the Toungoo dynasty in 1740 taking control of Syriam. During this period, French and British interests interloped in a number of administrative divisions and in 1824 the First Anglo-Burmese War began. During the first war the British made a first foray into Syriam before it was retaken by Burmese troops and the British retired from the area. Subsequently during the Second Anglo-Burmese War in 1853 the area came under the rule of the British East India Company after the province of Pegu was formally annexed to the

British.[9] The British ruled as administrators until Burmese independence on 4th January 1948.

During British rule, Syriam was an important port town that was characterized by industrial land on the east side of the Syriam ridge and rice fields on the west side of the Syriam ridge. The most prominent industrial activity at the time was the large oil works. The Burma Oil Company, Indo-Burma Company, and Rangoon Oil Company all had refineries in the area with the Rangoon Oil Company locating theirs in Thilawa (formerly known as Konthilawa). At the time, Thilawa village also was engaged in the construction of river steamers and river flats.

1.4.2 Ethnic Minorities and Indigenous Peoples

The ethnic make-up of the population is overwhelmingly Bamar (95%+) with Kayin, Rakhine, Indian and other smaller ethnicities also represented.

There are 17 wards and 28 village tracts in Thanlyin Township. Within this boundary, 93.34 percent is Burmese, 0.56 percent is Rakhine and 0.74 percent is Karen. In the population, 198,157 persons are Burmese, 1,573 persons are Kayin and 1,183 persons are Rakhine. Other races include Mon, Chin, Shan, Kachin and Kayah. Foreigners living in Thanlyin Township are Chinese, Indians, Bangladeshi and Pakistani. Among the population, 93.33 percent are Buddhist. Buddhist population is 198,157 persons and others include Christian, Hindu and Islam.

Kyauktan Township is a Township in Yangon (South) District of Yangon Region, Myanmar. Kyauktan Township is subdivided into 2 Towns include Kyauktan Town and Tadar Town. Kyauktan Township is also subdivided into 45 Village Tracts and there are 41 wards and 44 village tracts in Kyauktan township. The races live in Kyauktan township are mostly Bamar (157,073), Rakhine (90) and Kayin (224). Foreigners living in the township are Chinese, and Indians. Among the population, Buddhists are the main religion with 96.86 percent of total population. Other religions practiced include Christian, Hindu and Islam. The details of these demographics are shown in the following tables.

Table 70 Registered Ethnicities in Thanlyin and Kyauktan Townships (2014)

Township	Thanlyin		Kyauktan	
	Person	%	Person	%
Indigenous				
Kachin	52	0.02	3	0.001
Kayar	2	0.01	2	0.001
Kayin	1574	0.74	224	0.138

[9] The annexation of Myanmar by the British occurred in three wars on a piecemeal basis ending in the final annexation of the entire country in 1885.

Chin	224	0.11	12	0.007
Bamar	198,157	93.34	157,073	96.86
Mon	415	0.20	8	0.004
Rakhaine	1183	0.56	90	0.055
Shan	133	0.06	3	0.001
Foreigner				
Chinese	371	0.17	391	0.24
Indian	7,090	3.34	4345	2.67
Bangladesh	425	0.20	-	-
Pakistan	64	0.03	-	-
Others	2,615	1.23	-	-
Total	**212,304**	**100**	**162,521**	**100**

Source: Southern Yangon District Administrative Office, Thanlyin

Table 71 Religions of Thanlyin and Kyauktan Townships (2014)

Township	Religious (Persons)					Total
	Buddhist	Christian	Hindu	Islam	Others	
Thanlyin	198,157	1,851	7,579	2,102	2,615	212,304
Kyauktan	157,073	1,220	3,486	372	-	162,151

Source: Southern Yangon District Administrative Office, Thanlyin

1.4.3 Living and Livelihoods

There is small-scale fishing activity around the mangrove-lined streams exiting the SEZ from the western border and emptying into the Yangon River. These communities include fishermen dependent on fisheries activities and aquatic products for income and food security. It is considered likely that these small streams might provide a spawning ground for larger fish in the greater Yangon River system. There is also artisanal fish aquaculture and fishing occurring sporadically throughout the zone in seasonal ponds that are damned up during the rainy season.

Data from the Thanlyin and Kyauktan General Administrative Department characterizes the living and livelihoods in the overall Thanlyin Township (including parts of the SEZ).

Table 72 Agricultural Production in Thanlyin and Kyauktan Townships

Reported Livestock (head)							
Township	**Year**	**Buffalo**	**Cow**	**Pig**	**Chicken**	**Duck**	**Goat/Sheep**
Thanlyin	2013-2014	757	14,188	5,563	12,098	8,447	26,662
	2014-2015	995	14,420	5,855	280,860	18,850	2,400
Kyauktan	2013-2014	1,947	17,199	7,040	163,385	40,283	2,828
	2014-2015	2,248	12,345	5,730	186,943	28,786	2,885
Reported Meat Production (kg)							
Township	**Year**	**Buffalo**	**Beef**	**Pork**	**Chicken**	**Duck**	**Goat/Sheep**
Thanlyin	2013-2014	0	735,766	3,046,796	7,616,827	1,255,263	76,887
	2014-2015	0	797,559	3,321,125	8,355,869	1,371,645	83,456
Kyauktan	2013-2014	511	1,017	4,265	7,815	1,844	147
	2014-2015	513	1,114	4,669	8,581	2,020	161
Reported Poultry Egg Production (number)							
Township	**Year**	**Chicken Eggs**			**Duck Eggs**		
Thanlyin	2013-2014	37,821,400			7,001,500		

	2014-2015	41,646,300	7,618,100
Kyauktan	2013-2014	33,873	13,384
	2014-2015	37,394	14,662

Reported Dairy Production

Township	Year	Dairy Cows (head)	Dairy Products (kg)
Thanlyin	2013-2014	452	530,467
	2014-2015	593	695,945
Kyauktan	2013-2014	30	245
	2014-2015	173	5,322

Fish and Prawn Aquaculture

Township	Year	Fish			Prawn		
		Ponds	Acres	Production (kg)	Ponds	Acres	Production (kg)
Thanlyin	2013-2014	No aquaculture in Thanlyin					
	2014-2015						
Kyauktan	2013-2014	6	13	10,685	54	6,964	299,597
	2014-2015	6	13	1,141	61	10,935	702,106

Note: data includes statistics gathered by the GAD of Thanlyin and Kyauktan for the entirety of these two townships, including the project area.
Source: General Administrative Department, Thanlyin and Kyauktan

Table 73 Reported Industrial and Commercial Employment in Thanlyin and Kyauktan Townships

	Category	Township	Name	Type	Government/ Private	Employees
1	Factory	Thanlyin	Paper Parceling	Paper	Government	125
2	Factory	Thanlyin	(No-1) Petroleum	Petrol	Government	1,177
3	Factory	Thanlyin	Tin Factory	Metal	Government	142
4	Factory	Thanlyin	(No-10) Wood Mill	Teak/ wood	Government	134
5	Factory	Thanlyin	Glass Factory	Glass	Private	436
6	Factory	Thanlyin	Flat Zinc Factory	Zinc	Private	116
7	Factory	Thanlyin	Miba Gone Yae Garment	Clothes	Private	929
8	Factory	Thanlyin	Shwe Sagar Garment	Clothes	Private	1,235
9	Factory	Thanlyin	Sin Phyu Taw Garment	Clothes	Private	595
10	Factory	Thanlyin	Green Garment Garment	Clothes	Private	520
11	Factory	Kyauktan	Ship Breaking Factory	Iron	Government	50
12	Factory	Kyauktan	Food Factory	Crab	Private	180
13	Factory	Kyauktan	Clothing Factory	Clothes	Private	180
14	Factory	Kyauktan	Liquor Factory	Alcohol	Private	10
15	Factory	Kyauktan	Purified Drinking Water Factory (2)	Water	Private	30
16	Workshop	Thanlyin	War War Win Garment	Clothes	Private	11
17	Workshop	Thanlyin	Ever Smile Garment	Clothes	Private	20
18	Workshop	Thanlyin	Daw Nu Nu Khine Garment	Clothes	Private	15
19	Workshop	Thanlyin	Myittar Mon Garment	Clothes	Private	59
20	Workshop	Thanlyin	Linn Garment	Clothes	Private	26
21	Workshop	Thanlyin	Yadanar Drinking Water	Drinking Water	Private	10
22	Workshop	Thanlyin	Galorie Drinking Water	Drinking Water	Private	26
23	Workshop	Thanlyin	Shwe Thanlin Drinking Water	Drinking Water	Private	12
24	Workshop	Thanlyin	Duwon Drinking Water	Drinking Water	Private	10
25	Workshop	Thanlyin	Super Cool Drinking Water	Drinking Water	Private	19
26	Workshop	Thanlyin	Moe Thee Drinking Water	Drinking Water	Private	10
27	Workshop	Thanlyin	One Plus Drinking Water	Drinking Water	Private	7
28	Workshop	Thanlyin	Mr. Pure Drinking Water	Drinking Water	Private	12
29	Workshop	Thanlyin	Ever Drinking Water	Drinking Water	Private	30
30	Workshop	Thanlyin	Mirami Drinking Water	Drinking Water	Private	28

	Category	Township	Name	Type	Government/ Private	Employees
31	Workshop	Thanlyin	Yaza Drinking Water	Drinking Water	Private	11
32	Workshop	Thanlyin	Pai Hay Drinking Water	Drinking Water	Private	10
33	Workshop	Thanlyin	YMG Iron Door	Iron Grille	Private	37
34	Workshop	Thanlyin	Sky Star Bindery	Book	Private	41
35	Workshop	Thanlyin	KKL Cashewnut	Cashewnut	Private	45
36	Workshop	Thanlyin	Ko Nyi Nyi Cashewnut	Cashewnut	Private	70
37	Workshop	Thanlyin	Daw May Nan Khine Rattan	Rattan	Private	33
38	Workshop	Thanlyin	Myanmar Mosflies Mosquito Coil	Mosquito Coil	Private	20
39	Workshop	Thanlyin	Feel Hair Gel	Cosmetic	Private	87
40	Workshop	Thanlyin	U Ngwe Soe Car Engine Work	Workshop	Private	3
41	Workshop	Thanlyin	OK Footwear Business	Foot Wear	Private	10
42	Workshop	Thanlyin	Venus Foot Wear Business	Foot Wear	Private	27
43	Workshop	Thanlyin	Cobra Ointment	Medicine	Private	15
44	Workshop	Kyauktan	Aung Thukha Rice Mill	15 ton+ Rice mill	Private	30
45	Workshop	Kyauktan	Golden Dragon Rice mill	15 ton+ Rice mill	Private	35
46	Workshop	Kyauktan	Htapin Shwe Htee	15 ton+ Rice mill	Private	30
47	Workshop	Kyauktan	Htapin Shwe Htee	15 ton+ Rice mill	Private	30
48	Workshop	Kyauktan	Halar Rice Mill (94)	Under 15 Ton	Private	282
49	Small shop	Thanlyin	Garment x 27	-	Private	2,795
50	Small shop	Thanlyin	Powder Factory x 6	-	Private	10
51	Small shop	Thanlyin	Lathe x 6	-	Private	15
52	Small shop	Kyauktan	Snap Business x 2	-	Private	23
53	Small shop	Kyauktan	Motephat Noodles x 9	-	Private	30
54	Small shop	Kyauktan	Grilling Business x 18	-	Private	18
55	Small shop	Kyauktan	Iron Door Business x 8	-	Private	20
56	Small shop	Kyauktan	Iron Bending Business x 1	-	Private	5
57	Small shop	Kyauktan	Twin Khone x 24	-	Private	86
58	Small shop	Kyauktan	Car Workshop x 6	-	Private	10
59	Small shop	Kyauktan	Car Body Business x 4	-	Private	16
60	Small shop	Kyauktan	Car Brushing Business x 1	-	Private	2
61	Small shop	Kyauktan	Blacksmith x 20	-	Private	36

Note: data includes statistics gathered by the GAD of Thanlyin and Kyauktan for the entirety of these two townships, including the project area.

Source: General Administrative Department, Thanlyin and Kyauktan

1.4.4 Water Availability and Usage

The Township Development Committees of Kyauktan and Thanlyin have responsibility for providing water in their respective areas. At present, water sources for Thilawa area are underground water and surface water which is stored by three water storage reservoirs: Zarmani, Thilawa, and Bant Bwaykone in Thanlyin and Kyauktan Townships. The water rights for underground water belong to the Ministry of Development Affairs (MDA) and the rights to surface water belong to the Ministry of Agriculture and Irrigation (MOAI). Therefore, Zarmani and Bant Bwaykone reservoirs are controlled by MOAI. However, the Thilawa Reservoir is managed by MOI and Ministry of Construction (MOC).

Reportedly, the Zarmani Reservoir is used only for irrigation purposes. Thilawa Reservoir is utilized for industrial and irrigation water. The water supply from the Thilawa Reservoir is purified at 2 purification plants and sent to the various industries and facilities around the Thilawa SEZ area. There are not any industrial water supply issues presented and a water shortage has occurred only once in the past 16 years.

In addition to these surface water sources, there are also a number of groundwater wells found on site.

1.4.5 Education

Educational resources in Thanlyin and Kyauktan are divided into Higher Education (university), Basic Education High School (BEHS), Basic Education Middle School (BEMS), Basic Education Primary School (BEPS), Kindergarten, and Monastery School. The table below depicts the extent of educational infrastructure in the two surrounding townships.

Table 74 Educational Infrastructure (Secondary) in Thanlyin and Kyauktan

Township	Name of University / College / Science School	Location	Area (acre)	Number of Teachers	Quantity of Students	Ratio of Students to Teachers
Higher Education						
Thanlyin	Yangon Eastern University	Phayar Kone Village	158.1	509	9,375	18.42
Thanlyin	Navy University	Phayar Kone Village	110.0	113	1,868	16.53
Thanlyin	Technology University	Lat Yat San Village	310.1	342	7,294	21.33
Thanlyin	Economic University	Nyaung Thone Pin Village	208.2	93	1,350	14.52
Kyauktan	-	-	-	-	-	-
		Total	*786.4*	*1,057*	*19,887*	*17.7 (ave)*
Basic Education High School						
Thanlyin	BEHS (1)	Oak Pho Su	7.4	67	2,091	31.21
Thanlyin	BEHS (2)	Eastern New Town	5.4	75	2,628	35.04
Thanlyin	BEHS (3)	Htan Pin kone	7.9	44	1,266	28.77
Thanlyin	BEHS (4)	Pago Su	4.9	59	1,856	31.46
Thanlyin	BEHS Kyauk Yae Twin	Phayar Kone	1.3	58	2,413	41.60
Thanlyin	BEHS Phar Ku	East Phar Ku	6.1	24	841	35.04
Thanlyin	BEHS Thapyay Kone	Thapyay Kone	2.9	24	628	26.17
Kyauktan	BEHS (1)	Sanchain Mi Quarter	3.6	44	1,248	28.36
Kyauktan	BEHS (2)	Sinkan Quarter	1.2	48	2,087	43.48
Kyauktan	BEHS Tatar	Tatar Sub-township	3.4	37	982	26.54
Kyauktan	BEHS Mingalon	Mingalon Village	9.7	32	800	25.00
Kyauktan	BEHS Kamarkalote	Kamarkalote Village	7.2	20	623	31.15
Kyauktan	BEHS Khanaung	Khanaung Village	4.8	20	498	24.90
Kyauktan	BEHS Sittan	Sittan Village	5.0	26	572	22.00
		Total	*70.9*	*578*	*18,533*	*30.77 (ave)*
Basic Education Middle School						
Thanlyin	Sub BEHS (Old Town)	Middle Quarter of Old Town	0.9	37	1,414	38.22
Thanlyin	Sub BEHS (Yone Thapyay Kan)	Yone Thapyay Kan Village)	4.3	21	585	27.86

Township	Name of University / College / Science School	Location	Area (acre)	Number of Teachers	Quantity of Students	Ratio of Students to Teachers
Thanlyin	Sub BEHS Gamar	Kyaung Kone Sate Gyi Village Tract	5.5	35	1,290	36.86
Thanlyin	Sub BEHS Chaung Sout	Chaung Sout Village	5.7	22	534	24.27
Thanlyin	Sub BEHS Kyaung Kone Sate Gyi	Kyaung Kone Sate Gyi Village	2.2	27	998	36.96
Thanlyin	Sub BEHS Pyin Htaung School	Lat Yat San Village	2.4	55	2,175	39.55
Thanlyin	BEMS Laharyat	Laharyat Village	0.7	11	209	19.00
Thanlyin	BEMS Kon Chan Kone	Phayar Kone Village	1.1	23	950	41.30
Thanlyin	Sub BEMS Bot Thapyay Kan (1)	Bot Thapyay kan	1.3	12	477	39.75
Thanlyin	Sub BEMS Kayin Sate	Kayin Sate	2.3	13	493	37.92
Thanlyin	Sub BEMS Sit Pin Kwin	Sit Pin Kwin Village	1.1	11	443	40.27
Thanlyin	Sub BEMS Kalar Wae	Kalar Wae	0.5	12	514	42.83
Thanlyin	Sub BEMS Myayar Yoe	Lat Yat San Village	2.4	20	1,056	52.80
Thanlyin	Sub BEMS Htaw Wat	Aung Chan Thar Quarter	2.7	21	860	40.95
Thanlyin	Sub BEMS General New Village	General New Village	0.6	18	596	33.11
Thanlyin	Sub BEMS Nyaung Thone Pin	Amhu Htan Quarter	0.5	25	936	37.44
Kyauktan	BEMS Myoma	Middle Quarter	1.0	17	567	33.35
Kyauktan	BEHS(Sub) Myaingtharyar	Nyaung Wine Village	3.5	27	859	31.81
Kyauktan	BEMS Police Force(7)	Shwe Pyauk Village	7.0	16	459	28.69
Kyauktan	BEMS Pantaw	Pantaw Village	3.0	19	515	27.11
Kyauktan	BEHS (Sub) Kyonekan	Kyonekan Village	5.0	20	330	16.50
Kyauktan	BEMS Ywarthit Gyi	Ywarthit Gyi Village	3.1	22	349	15.86
Kyauktan	BEHS (Sub) Meepya	Meepya Village	2.0	25	702	28.08
Kyauktan	BEMS Kalartan	Kalartan Village	0.1	18	366	20.33
Kyauktan	BEMS Sinmakaw	Sinmakaw Village	0.8	14	180	12.86
Kyauktan	BEHS (Sub) Potetalote	Potetelote Village	4.0	18	590	32.78
Kyauktan	BEMS Asae	Asae	0.1	12	344	28.67
		Total	*63.7*	*571*	*18,791*	*32.04 (ave)*

Note: data includes statistics gathered by the GAD of Thanlyin and Kyauktan for the entirety of these two townships, including the project area.

Source: General Administrative Department, Thanlyin and Kyauktan

Table 75 Educational Infrastructure (Primary) in Thanlyin and Kyauktan

	Number	Quantity of Teachers	Quantity of Students	Ratio of Students to Teachers
Basic Education Primary School				
Thanlyin	56	422	12,083	28.63
Kyauktan	109	678	13,873	20.46
Total	*165*	*27,056*	*27,105*	*24.55 (ave)*
Kindergarten				
Thanlyin	Thanlyin Kindergarten	2	30	15.00
Kyauktan	None			

Note: data includes statistics gathered by the GAD of Thanlyin and Kyauktan for the entirety of these two townships, including the project area.

Source: General Administrative Department, Thanlyin and Kyauktan

Table 76 Educational Infrastructure (Monastic) in Thanlyin and Kyauktan

		Quantity of Teachers	Quantity of Students	Ratio of Students to Teachers
Monastery School				
Thanlyin	Pone Pyan	21	765	36.43
Thanlyin	Su Taung Pyae	45	1,509	33.53
Thanlyin	Thadama Zawtikaryone	19	677	35.63
Thanlyin	Thartana Mandai	5	29	5.80
Thanlyin	Damikar Yarma	9	224	24.89
Thanlyin	Su Htoo Pan	9	262	29.11
Thanlyin	Tharyar Kone	10	290	29.00
Thanlyin	Kharmar Yarma	21	774	36.86
Thanlyin	Wana Warthi Aye Yait San	5	146	29.20
Thanlyin	Wiyati Taw Ya	6	209	34.83
Thanlyin	Kaythaya Wadi	13	367	28.23
Thanlyin	Thamidawdaya Tayzathit	N/A	8,220	-
Thanlyin	Damadipa	12	228	19.00
Thanlyin	Thilawa	6	146	24.33
Kyauktan	Mee Pya Monastery	3	39	13.00
Kyauktan	Kamarkalote Monastery	7	109	15.57
Kyauktan	Myaingtharyar Monastery	24	888	37.00
Kyauktan	Tatar (1) Quarter Monastery	5	82	16.40
Kyauktan	Sinkan Quarter Monastery	5	132	26.40
Kyauktan	Shwe Kone Quarter Monastery	5	109	21.80
	Total	*230*	*15,205*	*26.16 (ave)*

Note: data includes statistics gathered by the GAD of Thanlyin and Kyauktan for the entirety of these two townships, including the project area.

Source: General Administrative Department, Thanlyin and Kyauktan

1.4.6 Cultural Heritage

In and around the Thanlyin and Kyauktan townships, there are 126 pagodas, 177 Buddhist temples, 5 churches, 10 mosques, 31 Hindu temples, and 2 Chinese Temples. The most important of these are the Kyaik Khauk Pagoda, the Yay Le Pagoda in the Hmawwun River south of the SEZ, and the Pardagyi Pagoda a few kilometers to the east of the SEZ.

There is no known significant cultural heritage existing within the non-excluded areas of the SEZ site itself. There are however numerous pagodas, temples, monasteries, churches, mosques, and Hindu temples in the greater area. The most significant cultural heritage assets near the Thilawa SEZ include the Kyaik Khauk Pagoda, believed by local people to be around 2,000 years old (but probably much younger), and the associated remnants of the ancient Mon kingdom of Pada located around the Pardagyi Pagoda several kilometers to the east of the SEZ.

The Pada Kingdom was a so-called ‘laterite’ kingdom in that the principal building materials used were laterite from the Syriam ridge, which is the last spike of the Pegu mountain range

running down to the Hmawwun River. The Ministry of Culture confirmed that laterite in the region is mostly situated 15m+ above sea level and the ground at lower elevations to the west is generally silty and is inappropriate for the type of construction conducted by these 'laterite' kingdoms. Therefore, since the SEZ lays predominantly below 15m above sea level, it is unlikely that any archaeological remnants of the Pada Gyi Kingdom exist directly in the 2,000ha SEZ area. While there were none identified, it is possible that some archaeological remnants of the Pada Gyi Kingdom might be located proximate to the route leaving the Thilawa SEZ and going to Dagon Bridge.

Cultural heritage identified is labeled on the map below. Cultural heritage that is identified in the zone is already excluded by the aforementioned government notice and will not be altered. A full list of the heritage identified corresponding with the numbers on the map is located in the appendix to this report.

Note: Please see appendix for full list of numbered items, location, pictures, and notes.
It was identified that five buildings (No 15, 16, 45, 46, and 49) were not cultural heritage and photos were not included in the full list.
Source: SEZ Management Committee Study

Figure 43 Cultural Heritage Identified on and around the Thilawa SEZ

1.4.7 Landscape

There is no virgin habitat left in the Project area, which has been completely converted to agriculture, residential, commercial, or industrial use. The landscape is similar to that in the surrounding region with agricultural lands dominating. As mentioned in other sections, the land does provide services including crop growing, livestock rearing, artisanal aquaculture in

dammed ponds, biomass fuel, and cultural resources nearby.

According to the Gazetteers[10] left by the British, even as far back as 1914, the land to the west of the Syriam ridge that constitutes the project area was not very fertile land and even back then was used largely for industrial purposes with the presence of several oil refineries, brick factories, ports, and river steamer building industries although it is likely that there was always interspersed agricultural activity that is still seen today.

Typical Mangrove-Lined Creek

Typical Rice Paddy

Phalankanoo Monastery near Bant Bway Kone Reservoir (excluded area)

View over Bant Bway Kone Reservoir (excluded area)

[10] Furnivall and Morrison (1914). *Burma Gazetteer, Syriam District Volume A.*

Project Area from Kyaik Kyauk Pagoda

View over field to factories

View over field (northern area)

Zarmani Dam

Factory and field

View over fields towards the port

Source: SEZ Management Committee Study

Figure 44Representative Landscape in Project Area

1.4.8 Health

The disease prevalence as reported by the respective GADs of Thanlyin and Kyauktan is as follows.

Table 77 Disease Prevalence in Thanlyin and Kyauktan

Township	Disease Type											
	Malaria		Diarrhoea		Tuberculosis		Dysentery		Hepatitus		HIV / AIDS	
	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths	Afflicted	Deaths
Thanlyin	11	-	1013	2	259	-	239	-	4	-	60 (2015) 63 (2014)	4 (2015) 2 (2014)
Kyauktan	5	-	728	-	258	-	471	-	14	-	10 (2015) 33 (2014)	0 (2015) 4 (2014)

Source: General Administrative Department, Thanlyin and Kyauktan

Table 78 Availability of Health Care

	Township	Name of Hospital / Health Facility	Type	Comment
1	Thanlyin	Thanlyin Hospital	Government hospital	200 beds
2	Thanlyin	Township Hospital	Government hospital	16 beds
3	Thanlyin	Chan Myae Myitta Hospital	Government hospital	20 beds
4	Thanlyin	Swan	Private clinic	General admission
5	Thanlyin	Aung (24) Hours	Private clinic	General admission
6	Thanlyin	Win	Private clinic	General admission
7	Thanlyin	Hlaing	Private clinic	General admission
8	Thanlyin	Myat Thukha	Private clinic	General admission
9	Thanlyin	Win Myittar	Private clinic	General admission
10	Thanlyin	Linn	Private clinic	General admission
11	Thanlyin	Kyaw	Private clinic	General admission
12	Thanlyin	That Thar Aung	Private clinic	General admission
13	Thanlyin	Aung Chann Myae	Private clinic	General admission
14	Thanlyin	San Mya Thidar	Private clinic	General admission
15	Thanlyin	Myitta Yait	Private clinic	General admission
16	Thanlyin	Kan Kaw Shwe Yee	Private clinic	General admission
17	Thanlyin	Moe	Private clinic	General admission
18	Thanlyin	Aung Thapyay	Private clinic	General admission
19	Thanlyin	Moe Thet	Private clinic	General admission
20	Thanlyin	Shwe Thet Lone	Private clinic	General admission
21	Thanlyin	Htet	Private clinic	General admission
22	Thanlyin	Myittar	Private clinic	General admission
23	Thanlyin	Taw Win	Private clinic	General admission
24	Thanlyin	Myitta Mon	Private clinic	General admission
25	Thanlyin	Aung	Private clinic	General admission
26	Thanlyin	Health Clinic	Private clinic	General admission
27	Thanlyin	Shwe	Private clinic	General admission
28	Thanlyin	Linn	Private clinic	General admission
29	Thanlyin	Nway Moe Saung	Private clinic	General admission
30	Thanlyin	Kyaw	Private clinic	General admission
31	Thanlyin	Parami	Private clinic	General admission
32	Thanlyin	Lamin	Private clinic	General admission
33	Thanlyin	Maristoke	Private clinic	General admission
34	Thanlyin	Free clinic	Private clinic	General admission
35	Thanlyin	Thitsar clinic	Private clinic	General admission
36	Thanlyin	Satku Yarzar	Private clinic	General admission
37	Thanlyin	Yuzana	Private clinic	General admission
38	Thanlyin	Family Care Fcc	Private clinic	General admission
39	Thanlyin	Linn Lat	Private clinic	General admission
40	Thanlyin	Aye Chan (24)	Private clinic	General admission
41	Thanlyin	Hlaing Myitta	Private clinic	General admission
42	Thanlyin	Lwin	Private clinic	General admission
43	Thanlyin	Laesar	Private clinic	General admission
44	Thanlyin	Han Thazin	Private clinic	General admission
45	Thanlyin	May	Private clinic	General admission
46	Thanlyin	Myat Thiri	Private clinic	General admission
47	Thanlyin	Depoler	Private clinic	General admission
48	Thanlyin	Diamond	Private clinic	General admission

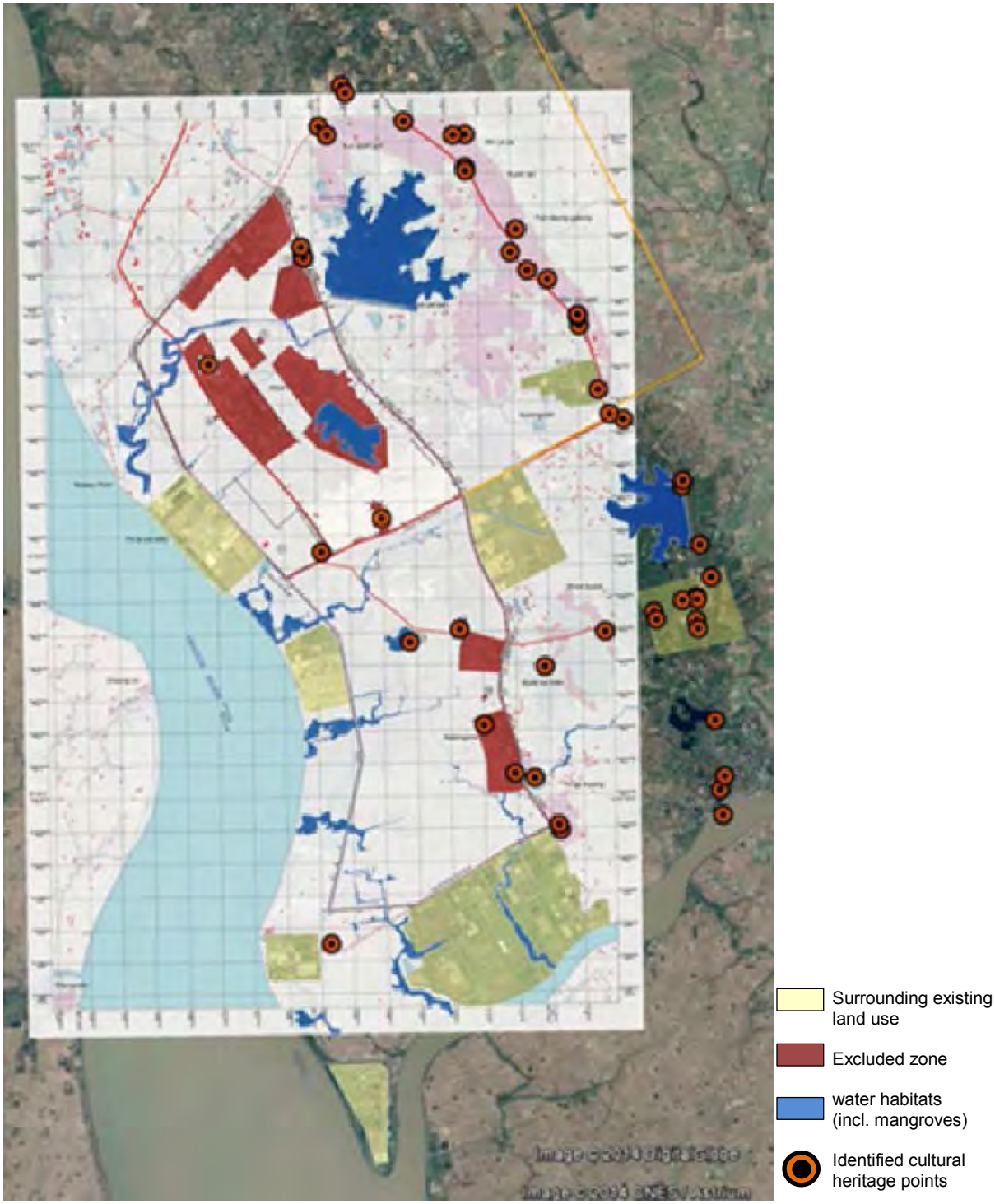
49	Thanlyin	Lat Yat San	Rural health center	-
50	Thanlyin	Phayar Kone	Rural health center	-
51	Thanlyin	Kalar Wae	Rural health center	-
52	Thanlyin	Thapyay Kan	Rural health center	-
53	Thanlyin	Day Zat	Rural health center	-
54	Kyauktan	Kyauk Tan Hospital	Government hospital	25 beds
55	Kyauktan	Tatar Sub-township Hospital	Government hospital	16 beds
56	Kyauktan	Meepya Village Tract	Government hospital	16 beds
57	Kyauktan	Leprosy Clinic	Government clinic	Treatment of Leprosy
58	Kyauktan	Malaria Clinic	Government clinic	Treatment of Malaria
59	Kyauktan	Tuberculosis Clinic	Government clinic	Treatment of Tuberculosis
60	Kyauktan	Doctor Aung Clinic	Private clinic	General admission
61	Kyauktan	Doctor Kyi Htoo Clinic	Private clinic	General admission
62	Kyauktan	Athawka Clinic	Private clinic	General admission
63	Kyauktan	Doctor Tin Maung Thein Clinic	Private clinic	General admission
64	Kyauktan	Woman Affairs Association	Rural health center	-
65	Kyauktan	Tatar Sub-Township	Rural health center	-
66	Kyauktan	Meepya	Rural health center	-
67	Kyauktan	Mingalon	Rural health center	-
68	Kyauktan	Kyonekan	Rural health center	-
69	Kyauktan	Kamarkalote	Rural health center	-
70	Kyauktan	Potetalote	Rural health center	-
71	Kyauktan	Myaingtharyar	Rural health center	-
72	Kyauktan	Khanaung	Rural health center	-
73	Kyauktan	Shan Chaung	Rural health center	-

Source: General Administrative Department, Thanlyin and Kyauktan

According to the International HIV/AIDS Alliance there are a number of sexually transmitted disease (STD) and Human immunodeficiency virus / acquired immunodeficiency syndrome (HIV/AIDs) clinics/programs run by government organizations and NGOs that would be willing to establish activities during construction and project implementation to deal with the influx of workers to the area.

1.5 Environmental Sensitivity

The following figure provides a summary of the potential socio-environmental sensitivities as described in the sections above.



Note: Map boundaries are not necessarily accurate.

Source: SEZ Management Committee Consultants using Google Earth imagery

Figure 45Environmentally Sensitive Areas