

令和元年度低炭素社会実現のための
都市間連携事業委託業務
(ダバオ市における気候変動行動計画策定支援等
による低炭素社会推進事業)
報告書

令和 2 年 2 月

公益財団法人地球環境戦略研究機関

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- 参考資料 6: ステークホルダー会合で集約された緩和策リスト
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(2020.1.16)

I. 事業の背景と目的

1. ダバオ市の社会経済状況

ダバオ市はフィリピン・ミンダナオ島の最大の都市である。総面積2,443.61 km² (943.48 平方マイル)のフィリピン最大の都市とされる。人口はミンダナオ島で最大の1,632,991人、人口増加率は年率2.305、人口密度は1ヘクタール当たり7人である。2023年の人口は、1,971,499人と推計されている。市には3つの下院選挙区があり、さらに11行政区に分かれており、バラングイ数は182である。

表1 ダバオ市の概要

総人口 (2015年)	1,632,991
陸地面積 (ヘクタール)	244,000
人口密度(ヘクタール当たり)	7 persons
人口増加率	2.30%
バラングイ／村落数	182
内国歳入割当金(IRA)シェア	3,330,085,561
内国歳入割当(IRA)依存率	53.97%
自治体総収入額	7,307,595,301.66
市民1人当たりの自治体の平均歳入額	4,474.97
生態系の型	分水嶺型
経済	第1級

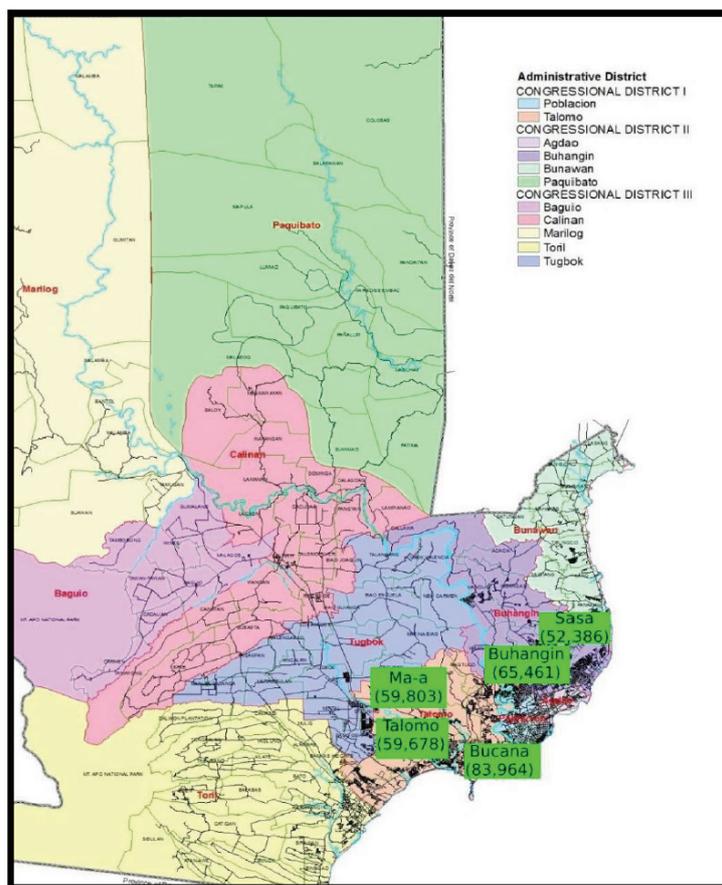
出典:ダバオ市社会経済指標

地理

ダバオ市はマニラの南東にあり、陸路での距離は588マイル(946 km)、海路では971 km(524 海里)である。ミンダナオ島の南東部に位置し、北西側にダバオ湾、対岸にサマール島がある。ダバオ市はミンダナオ島の南東部、北緯6°58'から7°34'、東経125°14'から125°40'に位置する。北でダバオ州に接し、東の境界はダバオ州とダバオ湾、南はダバオ・デル・スル、西はノース・コタバトと接している。¹

1 ダバオ市総合土地利用計画

ダバオ市は3つの下院選挙区を有し、それらが182のバラングイに分かれている。3選挙区には11の行政区がある(地図を参照)。



Source: Office of the City Planning and Development Coordinator

図1 ダバオ市地図および行政区

地形

ダバオ市の陸地面積2,443.61 平方キロメートル (943.48平方マイル)のうち、西部(マリログ地区)は丘陵地で南東の海岸に向かって低くなっている。市の南西部の端にはフィリピン最高峰のアポ山がある。市の主要な河川はダバオ川である。流域面積1,700 km² (660 平方マイル)以上、総延長160 km (99マイル)はブキドンのサン・フェルナンドの町に端を發し、河口はタロモ地区のバラングイのブカナにある。

気候

ダバオは熱帯雨林気候で、年間を通じて気温の変化はほとんどない。気候は完全な赤道帯型ではなく亜赤道帯型で、サイクロンに見舞われることは稀である。月平均気温は常に26°C(78.8°F)以上、月平均降水量は77ミリメートル(3.03インチ)である。

経済

ダバオ市はミンダナオの貿易・商業・産業の拠点として機能し、ダバオ地方の中心地である。ダバオ市は15年以上の間、年平均成長率2.53パーセントを記録してきた。メロマニラ以外の地域での最大経済地区として、同市はフィリピン南部最大の地域経済を支えている。

商業、貿易、産業²

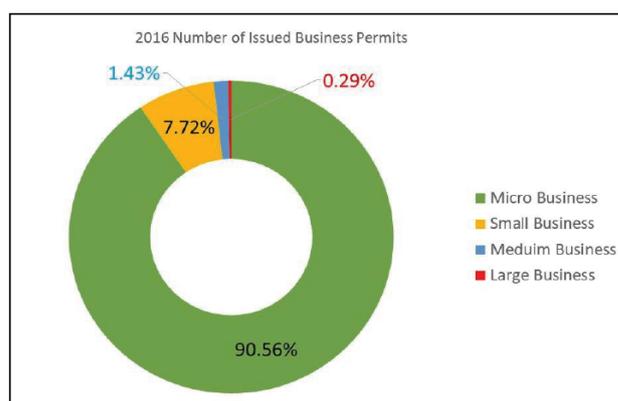
経済の最大セクターは農業で、バナナ、パイナップル、コーヒー、ココナツの栽培が行われている。マンゴー、ザボン、バナナ、ココナツ製品、パイナップル、パパイヤ、マンゴスチン、カカオ等の果物の輸出において島で中心的な役割を果たしている。2016年の穀物、果物、根菜、野菜の農工業面積は約74,158ヘクタール、総生産量は630,000トンであった。

家畜および水牛の生産量は2016年で74,570頭と推計されている。家畜総生産量のうち豚の生産は53.78% (222,341頭)、山羊11.26% (46,553頭)、家禽類6,293,775羽である。

ダバオ市の水産養殖生産は2016年で617,020トン、その内訳は、内水漁業908.79トン、養魚池227,418.92トン、深海漁業388,597.95トンである。

チョコレート産業が新たに発展してきている。マラゴス・アグリベンチャーズ社の開発したマラゴスチョコレートは今やフィリピンを代表する手作りチョコレートとして世界に認められている。一方、シードコア・エンタープライズ社はバリー・カレポー社にカカオを輸出する国内随一の企業である。ロレンツォ・グループ、アンフロ・グループ、AMSグループ、サランガニ・アグリカルチュラル社、ヴィズカヤ・プランテーション社等の地元企業はダバオ市に経営拠点と本社を置いている。ドール社、スミフル／住友、デルモンテ社のような多国籍企業は市内に地域本部を構えている。

2016年のダバオ市の事業者登録件数は36,254件、株式資本は2兆273億9530万819.52フィリピン・ペソであった。大企業からの投資が大部分(77.83%)を占める一方、雇用件数122,389(64.77%)の大半は零細事業者によるものであった。³



Source: Business Bureau

2016年に登録された事業分野数は60,759だが、各事業者が扱う事業分野はこれを上回る可能性がある。小売業は事業分野数の42.11%、サービス業18%、卸売業9.66%、レストラン・カフェテリア・軽食パーラー等の食品取扱業6.5%である。また、宅配サービス業の増加が顕著で5.31%と報告されている。⁴

図2 2016年度登録事業者数

2 ダバオ市総合土地利用計画 (CLUP) 2019

3 ダバオ市ビジネス局

4 同上

表2 2015年度事業種類別の事業者数・資本額・雇用者数

事業種類	許可件数	資本額	従業員数
零細	31,126	14,117,541,772.46	114,196
小規模	2,483	16,855,256,666.60	40,488
中規模	482	15,229,207,136.16	18,516
大規模	101	167,688,409,516.34	6,703
ダバオ市	34,192	213,890,415,091.56	179,903

出典：ダバオ市ビジネス局・市長室

2. フィリピン政府の気候変動関連の法令

フィリピンでは、気候変動法(共和国法第9729号、2009年)により、全ての自治体が気候変動行動計画(LCCAP: Local Climate Change Action Plan。以下、LCCAP)を策定することを求めている。同法は、特に、適応策に関する計画の策定を求めているが、パリ協定の下でフィリピンが提出した約束草案(INDC)では、「2000～2030年のBAUシナリオと相対的に2030年までに70%排出削減を実施する」⁵ことを目標に掲げていることから、緩和策を推進することも重視されている。

また、フィリピン政府は、持続可能な開発目標(SDGs)を推進する一環で、自発的国別レビュー(VNR)をこれまでに2016年と2019年に2回公表している。2019年のVNRでも、気候変動対策(目標13)として以下の2つを設け、推進している。

- ターゲット13.1 気候関連のハザードと自然災害に対する回復力と適応能力を強化する
- ターゲット13.2 気候変動対策を国の政策、戦略、計画に統合する

フィリピン気候変動委員会(CCC)が公開しているLCCAPの策定ガイドラインでは、緩和策も含めることも推奨されている。CCCはさらに、緩和策の基礎情報として必要となるGHGインベントリの作成マニュアルも公開し、要請に応じて自治体向けのトレーニングワークショップを開催する等、国内でも緩和策を含めたLCCAP策定支援が進められている。

3. ダバオ市と北九州市の協力関係

北九州市とダバオ市の都市間協力は、北橋健治市長とサラ・ドゥテルテ市長の間で交わされた、「戦略的パートナーシップ協定」(2016年11月15日に締結)と「環境姉妹都市提携に関する覚書」(2017年11月28日に締結)の下で推進されてきた。特に、廃棄物管理分野において、環境省やJICAの事業を展開してきている。

廃棄物管理分野における北九州市及び関連機関によるダバオ市への支援実績の例

- ・ 「フィリピン国・ダバオ市での廃棄物発電事業にかかる準備調査・事業化検討」

5 フィリピン政府は INDC の再検討を行っており、2019 年 2 月現在も国別貢献(NDC)は明らかにされていない。

環境省我が国循環産業の戦略的国際展開による海外でのCO₂削減支援事業(2017年度)

- ・ 「フィリピン共和国ダバオ市における廃棄物管理能力向上支援プロジェクト」

JICA草の根協力事業(2017年度～2019年度)

- ・ 「ダバオ市廃棄物利用発電技術普及促進事業」

JICA 開発途上国の社会・経済開発のための民間技術普及促進事業(2014年度)

2017年に新たに締結した覚書の下で、両市は、「低炭素社会づくり」等にも協力分野を拡大することとした。両市はこれまでの事業を通じて、北九州市と特にダバオ市幹部との間で信頼関係を構築していることから、ダバオ市の幹部を窓口にして、効率的な業務の実施が可能となっている。

4. 都市間連携事業の目的

フィリピン国の気候変動政策、ならびにダバオ市の成長著しい社会経済状況を踏まえ、これから持続可能な成長を遂げるには、行政として気候変動行動計画(LCCAP)を策定し、民間企業とも連携して具体的な案件実施による低炭素化を推進していくことが必要不可欠である。ダバオ市と北九州市間の都市間連携の枠組みで「低炭素社会づくり」も協力分野に位置付けたことを踏まえ、「北九州チーム」(北九州市、IGES、民間企業)として、低炭素都市づくりのノウハウも移転しながら、官民連携で、JCMの活動も視野に入れながら、ダバオ市の低炭素な発展に資する協力及び調査を行うことにした。

II. 案件形成可能性調査の目的と実施体制

1. 事業の概要

本事業は、北九州市一ダバオ市の都市間連携事業の下、ダバオ市側の要請に基づき、LCCAPの作成支援を行うと共に、本行動計画に具体的な緩和策を位置づけ、その緩和策の実施のための財源の一つとしてJCM設備補助事業の活用について検討するものである。具体的な支援項目は下記の通りである。各項目について、下に詳述する。

- 1) ダバオ市が進める LCCAP の策定支援
 - GHG インベントリ(GHGI)の作成支援
 - 緩和策の検討支援
 - 適応策の検討支援
- 2) ダバオ市内におけるエネルギー分野の低炭素化事業の実施可能性
- 3) ダバオ市が進める廃棄物発電事業の JCM 設備補助事業の適用可能性の検討

1) ダバオ市気候変動行動計画の策定支援

ダバオ市は2013年にUNHABITATの支援を受けて適応策を中心としたLCCAPを策定している。しかし、緩和策や、LCCAP作成のための体制整備については未着手の状況であった。このため、昨年度(2018年度)来、本事業では、ダバオ市側の要請を受けて、実施体制の構築支援も含め、GHGインベントリと緩和策の検討も含めたLCCAPの作成支援を行ってきた。支援に際しては、フィリピン国の政策や現地の状況を十分に踏まえたものとするために、フィリピンCCCが公開しているLCCAP作成マニュアルや、フィリピンの地方自治体に向けてCCCとUSAIDが共同で作成したGHGインベントリマニュアルを参考にすることにした。昨年度は、GHGインベントリの作成に向けてマニュアルを参照しながら、データ収集を開始し、2018年12月には市長令でLCCAP策定のための作業部会(TWG)チームが組成された。さらに、訪日研修(2018年11月6～8日)の機会を活用して、北九州市の、「北九州市地球温暖化対策実行計画・環境モデル都市行動計画～北九州ニューグリーンフロンティアプラン～」の作成経験を基に、北九州市側から市域内のGHG排出量の算定(GHGインベントリの作成)、緩和策の実施計画策定、実施、GHG削減効果の評価、ステークホルダーや庁内調整に係る知見を共有することで、ダバオ市職員5名のLCCAP作成能力向上も促した。当該支援は、IGESと北九州市を中心としながらも、アテネオ・デ・ダバオ大学とも連携して実施してきた。当該支援を行う際に特に注意した点として、IGES及び北九州市がデータや計画を作ってダバオ市側に渡すのではなく、ダバオ市側が自らの手で持続可能な実施体制を整えて、実施可能な施策を行えるようにするために、適切な情報提供や専門家との取次ぎは行うものの、できる限り自発的な行動を促す方向に持っていくこととした。

今年度は、昨年度の進捗状況及び活動期間を踏まえ、1)GHGインベントリの最終化、2)緩和策のロングリストの作成、をアウトプットとすることを目標に据えて、ダバオ市計画開発局(CPDO) TWGチームと連携して活動を展開した。

2) ダバオ市内におけるエネルギー分野の低炭素化事業の実施可能性

3) ダバオ市が進める廃棄物発電事業の JCM 設備補助事業の適用可能性の検討

本年度は昨年度に引き続き、下記2件の事業についてJCM設備補助事業への応募可能性を調査することとした。詳細はセクションIIIに記載する。

- ・街灯の発行ダイオード(LED)化事業
- ・廃棄物発電事業(発電機、ボイラー、変圧設備など)

2. 実施体制

本事業は、北九州市とダバオ市の都市間連携の下、IGESが調査実施主体として北九州市と共に調査を統括する形で行った。LCCAPの作成支援では、IGESとアテネオ・デ・ダバオ大学が連携してダバオ市を支援した。JCM設備補助事業に関する検討は、日鉄エンジニアリング(株)をはじめ、株式会社ドーワテクノス、株式会社JOIN PLANNINGと連携して調査を行った。

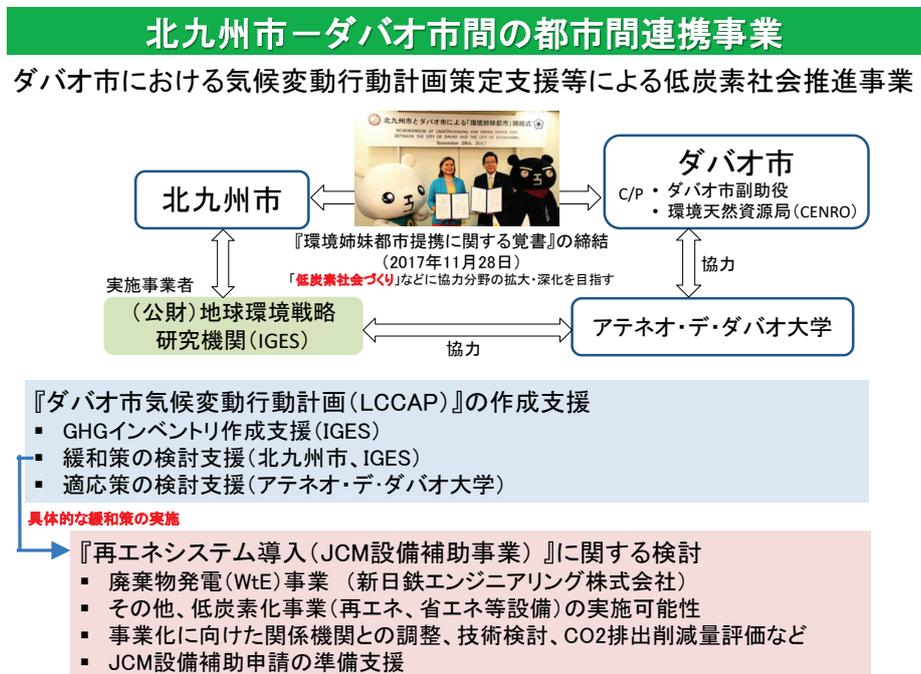


図3 実施体制図

III. 案件形成可能性調査結果

1. 活動1:ダバオ市気候変動行動計画の策定支援

①作業部会メンバーとの会合(2019年11月21日、ダバオ市庁舎)

2018年5月15日のキックオフ会合を皮切りに、LCCAP策定支援の一環で、GHGインベントリ策定支援および緩和策の検討支援を行ってきた。2018年12月にはダバオ市でLCCAP技術作業部会(TWG)が市長令の下で発足した。2019年2月の都市間連携事業の最終報告会で、ダバオ市の関係者と、フィリピンの地方自治体のLCCAP策定支援を進める担当であるフィリピン気候変動委員会の職員を引き合わせていたところ、都市間連携事業の活動が無かった期間(2019年3月～9月)にも、ダバオ市のイニシアチブで気候変動委員会の職員をダバオ市に招聘し、ワークショップを開催する等してGHGインベントリの作成作業を進めていた。

今年度の都市間連携事業が開始されてから、11月下旬にダバオ市を訪問した。その際、TWGメンバーと協議した上で、今年度の活動及び想定するアウトプットについては、昨年度の進捗状況及び活動期間を踏まえ、LCCAPのコンポネン特である、1)GHGインベントリレポート、2)緩和策のロングリストとすることで合意形成を行った(参考資料1参照)。打合せの席でダバオ市側から、ダバオ市のGHGインベントリの暫定値および想定される緩和策、脆弱性評価および想定される適応策の更新版が共有された。その時点ですでに2017年GHGインベントリの基礎データとして収集されたデータはすでに計算シートに反映されており、完成形に近いものになっていた。IGESからは、品質管理(Quality control, QC)の一環で、計算シートの確認を行うことを提案したが、確認作業を依頼するならば、所管省庁であり、ワークショップで指導してくれた気候変動委員会に依頼する方が好ましいとの理由から、確認作業は国内で完結する方向で進められることとなった。

他方、緩和策の一覧に関しては、気候変動の緩和策に限らず、どちらかと言えば適応策に近い災害対策の緩和策も含まれていたことから、何をもって緩和策と呼ぶのか、用語の確認を関係者間で行う必要性が感じられた。これについては、年明けに行われるステークホルダー会合で広く周知することにした。



図4 技術作業部会のメンバー



図5 LCCAP作成関係者間の協議

同会議中には、年明け2020年1月に東京都内で開催予定の都市間連携セミナーに関する情報も共有し、その場でLCCAPの進捗を報告することも確認した。なお、同セミナーには、セバスチャン・ドウテルテ副市長およびメルチョア・キタイン市議といったハイレベルの参加者が予定されていた。

②ステークホルダーワークショップ(2020年1月30-31日、マラヤン・カレッジ・ミンダナオ(MCM))

2020年1月に2日間のステークホルダーワークショップが、ダバオ市計画開発局(Davao City Planning and Development Office(CPDO))、IGES、MCMの共催で開催された。ダバオ市で行政計画を策定する際の最初のステップとして、ステークホルダーワークショップを開催するのは通例のことである。同ワークショップは、LCCAPの策定・実施において連携することが想定される市の関連部局やNGO、企業らを集めて、現在の状況を説明し、どのようなことを行っていくべきかについて広く意見を募る機会となった。

冒頭、同ワークショップをホストしたMCMのドジー副学長から歓迎の挨拶があった。それに続き、フィリピン気候変動委員会のレイチェル委員長から、気候変動に関する国内の状況が報告された。都市間連携の枠組みで支援を行っている北九州チームのメンバーとして、赤木リサーチ・マネージャーからは日本および北九州市の気候変動対策について、林プログラム・ディレクターからは、ダバオ市で目下行われている街灯のLED化に関する調査案件の紹介が行われた。これまでTWGメンバーを相手に協議を行ってきたが、幅広いステークホルダーに対して、北九州市の取組を発信できる良い機会となった。現地で環境行政の実施に関与しているNGOであるIDIS(Interface Development Interventions (IDIS) Inc.)からは、環境保護団体としてLCCAPのコンテキストで何ができるかの提案、ならびにLCCAPの策定に関する法的根拠および持続可能な開発目標(SDGs)の推進の観点も含めて情報共有がなされた。さらに、ダバオ市の現状として、脆弱性評価および適応策に関する情報がMCMのジャーナリン助教授から、GHG排出状況に関する情報がアテネオ・デ・ダバオ大学のドリス教授から共有された(参考資料2~4参照)。



図6 ワークショップの発表者



図7 ワークショップの様子

これらの情報を踏まえ、ステークホルダーは、7班(下記)に分かれ、各グループで考えられる気候変動行動について意見交換を行った。7班は、フィリピンのLCCAP策定マニュアルに示されるセクターに準拠したものである。各班には8~10名程度が参加した。

<グループワークを行う7班>

- | | |
|------------------|----------------------------------------|
| 1) 食料安全保障 | Food security |
| 2) 水の充足 | Water sufficiency |
| 3) 生態学のおよび環境的安定 | Ecological and environmental stability |
| 4) 人間の安全保障 | Human security |
| 5) 気候に優しい産業とサービス | Climate-smart industries and services |
| 6) 持続可能なエネルギー | Sustainable energy |
| 7) 知識と能力開発 | Knowledge and capacity development |

意見交換を進めるためにも、冒頭、次のようなガイディング・クエスチョンが与えられた。

<ガイディング・クエスチョン>

1. 気候変動(適応と緩和)および災害リスク削減管理(DRRM)に対処するために、これまでに行った、または現在行っているイニシアチブ/計画/政策は何か。担当しているのは誰か。
What initiatives/plan/policies do we have or are doing now that address climate change (adaptation and mitigation) & DRRM? Who are in-charge of those?
2. 今日共有された情報を踏まえ、気候変動対策として今やらなければならないことは何か。
Based on what we learned from the inputs today, what are the things that must be done now to address climate change?

3. 次の方法で初期計画を完了しましょう。

Let's complete our initial plan by:

a) 行動を主導する人の名前またはオフィス/部署を入力する。

Putting in names or Office/Dept. who would lead the action;

b) あなた又はあなたの部署が達成できることが何か、あるいは何をやらなければならないかを示す。

What can you or your office can commit to achieve or do the things that must be done.

約3時間のグループワークに続いて、各班の代表者から結果が発表された。基本的には各部署およびNGOらがすでに行っている活動を主として、LCCAP推進の観点からも各取組を推進していく重要性が説明された。

この時点では、幅広い意見を募っていることから、市がLCCAPIに位置付けていくかどうかについては、今後、CPDOがイニシアチブを取って専門家と協議し、絞り込みを行っていく考えが示された。

最後にCPDOから発表者に対して感謝状が贈られるとともに、全ての参加者に対して修了証が授与された。これから2020年6月までにLCCAPの完成を目指すとの考えが共有され、ワークショップを閉会した。



図8 グループワークの様子



図9 グループワークの結果報告

③LCCAP 策定支援の成果物

昨年度から取り組んできたGHGインベントリレポートおよびステークホルダー会合で集約された緩和策のリストの2点を、今年度のLCCAP策定支援の成果物として整理した(参考資料5、6参照)。

GHG インベントリの概要

ダバオ市の推計によれば、2017年のダバオ市のGHG排出量は約470万トンであった。最大の排出源は工業プロセスであり、総排出量の6割を占めた。それに続き、交通からの排出量が約3割、家庭における燃料の燃焼からの排出量が約1割を占めた。工業プロセスのデータソースはセメント企業によるものであるが、その他の分野も含めてデータの完全性には疑問が残り、また、必ずしも2017年のデータを使用せず、他の都市のデータをやむを得ず代替して使用しているところもあることから、将来的な改善点として、データの完全性を高めることが挙げられる。なお、これ以外にも、ダバオ市のGHGインベントリ策定における課題としては、次のことが挙げられている。計算作業のコーチングについては将来的な支援が期待されているところである。

<ダバオ市の GHG インベントリの課題>

1. データのフィルタリング: 事業者の特定の業務に関する数値については、GHGインベントリで求められるカテゴリーに分類されていないものがあつた。そのためTWGチームは可能な限り、公表されている参考ベースラインを用いてデータの抽出を行った。今後、GHGインベントリのプロセスと次回の報告に活用できるよう、市のビジネス局と協力し、より正確なデータ分類を入手する必要がある。
2. 大半の事業者が情報開示に難色を示すため、商工業プロセスの総生産額のデータの獲得が難しい。電力消費量については、市のエネルギー局と連携して、より意味のあるデータとして細分化された情報を得る必要がある。
3. TWGチームの能力向上を強化し、ツールの習得、特に定量化プロセスとパラメータおよびカテゴリーごとの不確実性の算出の習得が求められる。習得途上の課題の一つとして、GHGインベントリユーザーズマニュアルに記載されていない情報の解釈に困難が伴うことがあつた。チームがより効果的に役割を果たせるよう、より一層の指導教育が必要である。
4. 他の行政機関との協力と連携: 次回の報告において、固形廃棄物および廃水処理・排出に関するGHG排出量の定量化については、ダバオ市TWGチームの担当部分で準備を強化する必要がある。GHG 排出量アカウンティングに必須の情報を確保するには、ベースラインとデータ収集をさらに包括的に行うことが必要である。この作業に関しては、TWGチームには市の環境管理局の支援と指導および連携が必要であろう。

なお、今回のGHGインベントリレポートを作成するにあたっては、ダバオ市の2017年GHGインベントリに使用した方法論およびデータ、データソース等を記載する形式を取った。GHGインベントリは継続的に更新することで改善が進むものであり、その際には前回どのようにデータベースを構築したのかアーカイブ情報が重要である。ダバオ市のGHGインベントリの今後の改善に繋がる一助となることを期待する。

緩和策の概要

ダバオ市の緩和策には、グループの分け方もあり、幅広い取組内容が包含されている。特に「水の充足」の班で項目が多くなっているが、参加したNGOのうちIDISの存在感が際立ったことに起因している。今後、JCMの適用も考えられそうな案件としては、次のようなものが見られた。

表3 JCMの適用が考えられる緩和策

食料安全保障		
再生資源の活用/Go for renewable energy sources	風力や太陽光を利用したポンプや灌漑システムの検討/ Explore windmill, solar powered pump and irrigation system	関連する SDGs: 13, 7, 11
バイオエネルギー/Bio energy	Process livestock/poultry waste into organic fertiliser; Biogas technology	関連する SDGs: 2, 7, 11, 15
CLIMATE-SMART INDUSTRIES AND SERVICES		
グリーンビルディングコード/ Amend Green Building Code	グリーンハウスの建築/ Build Green Houses	関連する SDGs: 2, 11, 13
バラングイレベルの全てでリサイクル資材の使用を義務付け/ Mandatory Materials Recycling Facility for all Barangay Local Government Units	商業施設、施設・学校、役所/ Commercial establishments, institutions/schools, subdivisions	関連する SDGs: 11
SUSTAINABLE ENERGY		
遠隔地および森林における小水力発電/ Mini Hydropower supply for off-grid and forested areas	関連部局と研究を実施/ Conduct studies in collaboration with agencies	関連する SDGs: 13, 11, 7
車両の転換: 他の燃料利用/ Vehicle conversion: use of alternative fuels	行政主体と研究を実施/ Conduct studies with government agencies	関連する SDGs: 13
バイオディーゼル燃料に格上げ/ Upgrade to biodiesel fuels	実現可能性調査を実施/ Conduct Feasibility Studies	関連する SDGs: 11, 13, 7
ユーロ IV 燃料の推進/ Promote Euro IV Fuels	液体燃料の節約に関する情報教育コミュニケーションキャンペーン/ Information Education Communication Campaigns on Liquid fuels conservation	関連する SDGs: 13

ここで挙げられた取組も含め、リスト化された緩和策はLCCAPに実際に位置付けられるかどうかは現時点では不明であり、さらに、イニシャルアイデアの域を出ていないため、LCCAPが完成された時点で、改めて、北九州チームとして、LCCAPに位置付けられた緩和策について支援できることがあるかについては確認することとなるだろう。

なお、緩和策の一覧にするにあたり、ステークホルダーワークショップで集約された情報をリスト化し、さらに、SDGsの番号との紐づけを行った。これにより、ダバオ市のSDGs推進の一助となるものである。

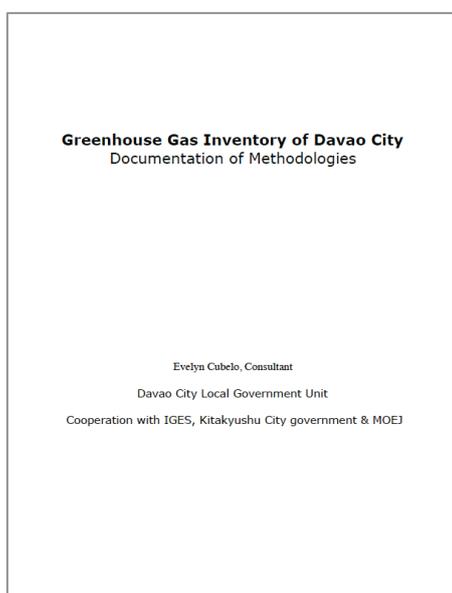


図10 GHGインベントリレポート

MITIGATION OPTIONS AND PRIORITY AREAS.
There are already a number of initiatives that has been pushed forward to address and mitigate the impacts of climate change. The stakeholders of the Davao City LCCAP Formulation are proposing the following priority areas as GHG mitigation options and as inputs to the LCCAP planning process.

FOOD SECURITY

What must be done?	What do we need to fulfill/achieve it?	Who will do it?*	Mitigation/SDG Targets
Land Conversion Regulation	- Protect prime agriculture areas from conversion to other uses - Lobby for limit in allowed conversion to 15%*	Davao City Agriculture Fisheries Development Plan*	GHG emissions reduction- SDG 13*
Soil management of areas prone to Landslide/Soil Erosion	- Introduction of Sloping Agriculture Land Technology* - Practice of zero/minimum tillage farming*	*	Mitigation - reduction of GHG releases from soil and biomass; low carbon- SDG 13, 15*
	Multi-cropping system*	*	Reduction of synthetic fertilisers and pesticides; low carbon emissions- SDG 2, 12, 13, 15*
	Regulate mechanised farming*	*	Minimum tillage - reduction of GHG releases from soil, low carbon- SDG 13, 15*
Go for renewable energy sources	Explore windmill, solar powered pump and irrigation system**	*	Reduction of fossil fuel use; GHG emission reduction, low carbon- SDG 13, 7, 11*

図11 緩和策のリスト

④LCCAP 策定支援業務のまとめ

ダバオ市で最初のLCCAPが完成するのは2020年6月頃になる見込みとされているが、都市間連携の枠組みの下、計画策定および実施の基盤を整理することができ、LCCAPのコンポーネントづくりにも貢献することができた。当初に想定していた、都市間連携事業の下で調査する案件(廃棄物発電事業やLED街灯化)をLCCAPにも位置付けるという作業は、政治的判断および民間企業が主体的に進めるものという観点から、LCCAPに位置付けることは叶わなかったが、それ以外でダバオ市の関心のある緩和策について、今後、JCMの案件となり得るものがあるかについては、意見交換を続けていくことを考えている。

2. 活動2:ダバオ市内におけるエネルギー分野の低炭素化事業の実施可能性

ダバオ市は条例「ダバオ市管轄域内の街路灯設備としてLEDを設置するダバオ市自治体街路灯効率プログラムを、ダバオ電灯電力会社(Davao Light and Power Company:以下、DLPC)が遵守することを要求する条例(条例0409-18号2018年通番)」(以下、LED条例)で市の管轄域内の街路灯すべてを高圧ナトリウム(HPS)灯からLED照明に変換することを定めている。

市内の約40,000本の街灯を5年間かけて全数LEDに更新する予定で、セントラルビジネス地区(CBD)域内を中心にHPSからLEDへの変更は既に開始されている。今後3年間をかけて22,788本の街灯をLED化する予定で、22,788本を対象にJCM設備補助事業化の検討を実施した。22,788本の内訳は、下図の通り、それぞれ60W(10,008本)、80W(3,348本)、110W(7,632本)、212W(1,800本)となっている。

表4 ダバオ市にてLED化予定の街灯種類

Wattage	Yearly Qty	Total for Remaining 3 years
60W	3,336	10,008
80W	1,116	3,348
110W	2,544	7,632
210W	600	1,800
Total units		22788

既存の街路灯の交換品として設置するLED街路照明の要件(最小限の仕様。LED条例から抜粋)

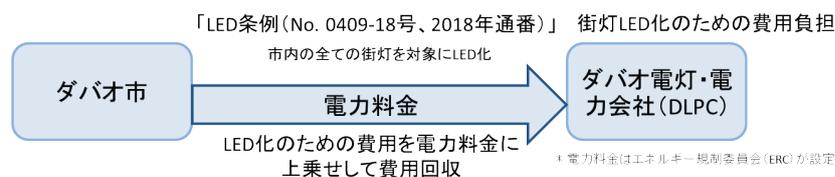
- a. 照明器具は、半導体技術(LED)をベースにした光源を利用することに特化して設計されていればよい。他のタイプの光源用に設計された製品、LED光源向けに適応させたかまたは改造した製品は認めない。
- b. 光および制御装置コンパートメントの密閉性は、最低レベルでIP66である。
- c. 破壊に対する耐衝撃性の最低レベルはIK08(10段階評価で)とする。
- d. 照明性能の寿命は、焼き付け時間10万時間でL80B10を最低限満たすこと(10万時間で80%のルーメンを維持したランプが90%存在する)。これは、照明器具の光の出力の急速な減衰を防止するため。
- e. 電気安全等級: クラスI、絶縁線を二重に配置
- f. 力率: >90、100%負荷で
- g. 使用時周囲温度(Ta): 45°C以上
- h. 主電圧公差: 120V – 227V

- i. 色温度 CCT: 3000k
- j. 演色評価数 CRI: >70
- k. ワット当たりのルーメン: 最低値 85
- l. 筐体は、ダイカストアルミニウム合金製で透明でフラットな強化ガラス保護付き(ポリカーボネイトやそれに類する材質は認めない)。
- m. サージ保護装置: 10kV
- n. 照明器具傾斜角システム: 最小で +5 ~ -10 度
- o. メーカー保証: 6 年以上
- p. IEC 苦情認証は次のものに付与が必要: IP、IK、フラグメンテーション、EMC、LM80 試験
- q. すべての測定作業は ISO17025 認証済みの試験設備で行う。
- r. CCTV セキュリティ監視設備で捉える物の外観が、これらの照明の使用によって妨害されたり損なわれたりしてはならない。

LED照明の設置に関する経費については、本条例によりDLPCがその経費を全額負担することとなっており、今後ダバオ市がDLPCに支払う電気代に導入費用を上乗せする形で費用回収をすることになっている(下図参照)。また、DLPCが実施する街灯のLED化事業については、フィリピン国エネルギー規制委員会(ERC)の方で予算が承認されており(ERC CASE No.2018-123RC)、DLPC側で事業予算が確保されている。

したがって、JCM設備補助事業により、DLPCが支払うLED化に伴う初期投資分を削減することで、今後ダバオ市がDLPCに支払う電気料金が削減されることとなり、ダバオ市民へ広く裨益効果が及ぶ事業となっている(下図参照)。

元々の事業スキーム



JCM設備補助事業の適用



図12 街灯のLED化事業スキーム

街灯のLED化事業に伴っては、昨年度からDLPC経営トップや技術部門と協議を進めてきており、昨年度日本側から提案した製品の技術評価結果とともに、DLPC側が発注する技術仕様内容について情報提供を受けている(参考資料7参照)。その技術仕様に基づいて、提案事業者(株式会社ドーワテクノス、株式会社JOIN PLANNING)は一から製品設計をし直し、下記の製品サンプルを作成してDLPC側に提出した。



図13 提案事業者作成による製品サンプル

本年度は、これらの新サンプル品の技術評価及び財務評価をDLPC側と協議するとともに、JCM設備補助事業に向けた協議を行った。

第一回現地調査(2019年12月10日)では、DLPC側から提案製品に関する技術評価報告があった(参考資料8参照)。DLPC側に提出しているサンプル品の中で、110Wのサンプル品にサージ防護機器が付いていなかった点(これは、人為的ミスによる付け忘れが判明)、ポールとLED機器を繋ぐジョイント部分についてサイズが異なっていたことが指摘された(既存のポールを使用することによりLEDとの接続部の直径を42mmに変更する点)が、それ以外の商品性能に関する部分について全て基準を満たしており、高評価を得た。次回訪問時まで、ジョイント部分の器具を作り直すことで、技術評価については暫定的に終了したとみなされた。また、次回訪問時に、JCM設備補助額を反映した見積り金額や、次年度設備補助申請のスケジュール・申請書類・条件等を確認するとともに、DLPCによる入札スケジュールを協議することで合意した。

2020年1月31日に第二回目のDLPCとの現地協議を開催した。冒頭、前回の技術評価報告時に指摘されたジョイント部分の修正器具を日本側から提示した。次に、JCM設備補助事業の概要、申請条件、スケジュール等を説明するとともに、公益財団法人地球環境センター(GEC)との事前協議内容を踏まえた財務面に関する協議を行った(参考資料9参照)。協議内容に関する主な点は下記の通り。

- 22,788 本を対象とした CO2 削減見込み量は、21,932.6 t-CO2（法定耐用年数:10 年）
（方法論:JCM_ID_AM018_ver01.0 を基に計算）
- プロジェクト費用に対して、費用対効果の 4,000 円/t-CO2 を条件として設定する場合、約 9,000 万円の補助金(補助率:約 20%)が見込める。
- JCM 設備補助事業の申請に当たっては、DLPC が本 LED 事業を一般競争入札にするのではなく、日本側代表事業者(株式会社ドーワテクノス)に対して、特定指名入札をすることが条件。
- 3 年一括発注の際に、さらに値引きをすることを日本側から提示
- その他、JCM 設備補助事業への申請に当たって、DLPC 側が発注時期を柔軟に設定することや、申請に当たって提出書類(投資回収年数及び内部収益率の計算過程・根拠の説明資料(補助あり、なしの 2 通り)、共同事業者の経理状況説明書など)を DLPC 側から提供してもらうことについて合意を得た。

以上の協議結果を踏まえ、日本側から提示された金額や条件(特定指名入札による3年一括発注)が可能か、DLPC側で社内協議をすることとなった。



図14 第一回現地調査



図15 第二回現地調査

第二回現地調査を前に、JCM設備補助事業の申請に当たって、公益財団法人地球環境センター(GEC)との事前協議を行った(2020年2月22日)。協議に当たっては、ヒアリングシート(参考資料10参照)を基に実施し、特に下記の点についての確認を行った。

- LED 照明の法定耐用年数
→法定耐用年数は 10 年を想定
（根拠資料:『減価償却資産の耐用年数などに関する省令』の「別表第一機械及び装置以外の有形減価償却資産の耐用年数表」の構築物、金属造のもの、つり橋、煙突、焼却炉、打込み井戸、へい、街路灯及びガードレール）

- 共同事業者からの提出書類について
 - 「投資回収年数及び内部収益率の計算過程・根拠の説明資料(補助あり、なしの2通り)」については、補助金が無いと実施が難しいことを示す資料として必要。また、「共同事業者の経理状況説明書」は、上場企業であれば株主に公開されている資料などが活用できる。
- MRV モニタリングの実施内容
 - インドネシアの街路灯への LED 灯の導入プロジェクト(方法論 ID_AM018_ver01.0)が参照できる。代表事業者は、モニタリングシートを記入して報告し、第三者機関による検証がある。その後、代表事業者から発行申請を行う(クレジットの配分は予め決めておくが、日本政府に50%以上という条件がある)。採択1年後に実施し、その後は複数年まとめて申請することもできる。
- 利益排除や補助率の考え方や、国際コンソーシアムの実施体制図上での補助金の流れについて
 - 仕入原価に対する補助金付与という考え方。一方、国際コンソ内の日本の代表事業者から共同事業者への売値については関与しない。そのため、必要なければ補助率や仕入れ原価を共同事業者に情報開示する必要はない(共同事業者からの納品書は必要)。代表事業者は、メーカーから得た見積書、発注書、契約書、送金証明書などを提出する必要がある。
- 来年度の JCM 設備補助事業の公募スケジュール
 - 現時点では、来年度も本年度と同様のスケジュールを想定している。

JCM設備補助事業における事業実施体制案としては下図の通りとなる。代表事業者として株式会社ドーワテクノス、設備メーカーとして株式会社ジョインプランニング(コンソーシアム外に位置)を選定し、共同事業者はDavao Light and Power Company Co., Ltd.(DLPC)となっている。

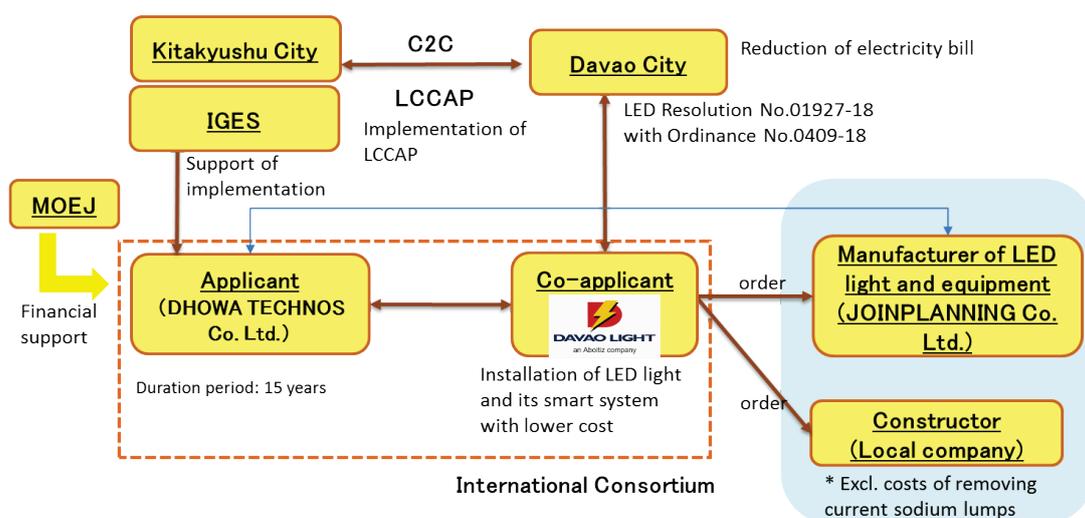


図 16 ダバオ市における街灯の LED 化プロジェクトの実施体制図案

街灯のLED化に伴うGHG削減効果については、カンボジアでのナトリウムランプからのLED照明への転換プロジェクト(方法論No.KH_AM001)およびインドネシアの街路灯へのLED灯の導入プロジェクト(方法論ID_AM018_ver01.0)を参考とした。

$$ER_p = RE_p - PE_p$$

Criterion 1	The project installs LED street lighting system utilizing wireless network control, which is connected to an electricity grid system.
Criterion 2	All lighting equipment in one lighting system has the same specifications.
Criterion 3	Wireless network technology enables controlling of the volume of lighting.

$$RE_p = \sum_i P_i \times (\eta_{PJ,i} \div \eta_{RE}) \times PO_{i,p} \times EF_{grid} \times 10^{-6}$$

- PE_p Project emissions during the period p (tCO₂/p)
 $PEC_{i,p}$ Total amount of electricity consumed in the project lighting system i during the period p (Wh/p)
 EF_{grid} Grid emission factor of Mindanao grid (tCO₂/MWh)
 i Identification number of the lighting system

$$PE_p = \sum_i PEC_{i,p} \times EF_{grid} \times 10^{-6}$$

- RE_p Reference emissions during the period p (tCO₂/p)
 P_i Rated power consumption of a lighting equipment used in the project lighting system i (W)
 $\eta_{PJ,i}$ Luminaire efficiency of a lighting equipment used in the project lighting system i (lm/W)
 η_{RE} Luminaire efficiency of the reference lighting system (lm/W)
 $PO_{i,p}$ Total operating hours of project lighting system i during the period p (hrs/p)
 EF_{grid} Grid emission factor of Mindanao grid (tCO₂/MWh)
 i Identification number of the lighting system

出典：<https://www.jcm.go.jp/kh-jp/methodologies/34>

その他、GHG削減効果を算定する上で、下記の条件を設定した。

- 今後 3 年間をかけて 22, 788 本の街灯(60W:10,008 本、80W:3,348 本、110W:7,632 本、212W:1,800 本)を LED 化する予定。
- フィリピン・ミンダナオ島の排出係数 0.286 tCO₂/MWh を使用
(出典：http://gec.jp/jcm/jp/kobo/h30/mp/jcmsbsd30_emission_factor0723.pdf)
- 法定耐用年数は 10 年を想定

(『減価償却資産の耐用年数などに関する省令』の「別表第一機械及び装置以外の有形減価償却資産の耐用年数表」の構築物、金属造のもの、つり橋、煙突、焼却炉、打込み井戸、へい、街路灯及びガードレール)

表5 街灯のLED化事業に伴うGHG削減効果の算定方法

				DHOWA TECHNOS JOINT PLANNING				
HPS (W)	actual power consumption incl. ballast	LED (W)	Number of units to be replaced	luminance	Number of lights	W/pcs	actual power consumption (W)	Luminaire efficiency (lm/W)
70	85 →	60	10,008	6165	1	45	41.5	137
150	171 →	80	3,348	8220	1	60	57.8	137
250	300 →	110	7,632	10960	1	80	83	137
		210	1,800	21920	1	160	157.9	137
			22,788					

Wh	Wh/day	Wh/year	Total power consumption (Wh/year)	Project Emission (tCO2/year)	Reference Emission (tCO2/year)	GHG emission reduction (tCO2/year)
41.5	498	181,770	1,819,154,160	520.28	1174.8	
57.8	693.6	253,164	847,593,072	242.41	547.4	
83	996	363,540	2,774,537,280	793.52	1791.8	
157.9	1894.8	691,602	654,372,000	187.15	422.6	
		1,490,076		1,743.36	3,937	2,193.26

上記を基にした計算の結果、21,932.6 t-CO₂e/年のGHG削減効果が見込まれることが分かった。

3. 活動3: 廃棄物発電事業の二国間クレジット制度設備補助事業の適用可能性調査

ダバオ市の廃棄物発電事業については、フィリピン国内で第一号となる見込みであり、他都市への展開のモデル事業となることが期待される。ダバオ市の廃棄物発電事業については、別途外務省の方で無償資金協力事業として「ダバオ市エネルギー回収型廃棄物処理施設整備計画」の実施が、調達代理機関を通じた調達代理方式で行われる。

したがって、JCM設備補助事業の実施については単独での検討ではなく、上述の事業権付無償事業との組み合わせの可能性を検討する必要がある。JCM設備補助事業の対象設備として燃焼ガス冷却設備(ボイラなど、法定耐用年数15年)を想定したが、廃棄物発電事業の入札公告の手続きなどが当初想定よりも遅れており、詳細な設備設計や見積りが作成できなかったため、本年度は特にダバオ市の廃棄物発電事業の準備状況についての調査や実施支援を行った。

ダバオ市の動向

ダバオ市は廃棄物発電施設の建設予定地として、市内のバランガイBiao Escuelalにある私有地9haの用地取得の手続きを進めてきており、議会承認手続きを経て、2019年10月に用地買収を完了した(下図参照)。

また、廃棄物発電事業の実施において、DENRから環境適合証明証(ECC)を申請・取得する必要があるが、その際にWtE事業の実施を明記した「ダバオ市の廃棄物管理10年計画」を提出する必要がある。この「ダバオ市の廃棄物管理10年計画」は、DENRにより2019年11月に承認された。



図17 ダバオ市WtE施設の建設予定地

フィリピン国の動向

2019年8月2日、ダバオ市とともにDENRのAntiporda次官を訪問し、WtE事業の概要について説明するとともに、DENRが作成しているWtE事業に関する省令(DAO)について協議を行った。特にダイオキシンの排出基準値についての意見交換を行い、日本のダイオキシン排出基準値やその設定方法、ダイオキシンインベントリに関する情報を提供した(参考資料11参照)。本協議におけるDENRとダバオ市側の出席者は下記の通り。

- DENR(Antiporda 次官、Nolan Francisco(廃棄物管理担当課長), Delia Valdez(廃棄物管理担当官)、DENR 地域事務所長、DOST(科学技術省) Esguerra 氏 等
- ダバオ市:Domingo 氏(副助役)、Madrazo 氏(WtE 事業管理チーム副プロジェクトマネージャー)、Gallo 氏(WtE 事業法務担当) 等

2019年11月26日、DENRから廃棄物発電事業の実施に関する省令(DAO(No.2019-21))が発行され、廃棄物発電事業の実施に関する細則が定められた(参考資料12参照)。本省令には、ダイオキシンの排出基準値(0.1 ng-TEQ/NCM)が規定されている。

また、同年12月9日、JICA技術協力チームとODA案件の調達代理機関チームと共にDENRを訪問し、廃棄物発電施設からの焼却灰の処理基準について協議を行った。協議によって、最終処分場での溶出基準を順守することが、既存の関連法令基準となることを確認し、排出基準については現行法令では規定していないことを確認した。

さらに、フィリピン議会Gatchalian上院議員の呼びかけにより、WtE法案に関する公聴会が開催された(2020年1月28日、2月11日)。ダバオ市、関連省庁など(NGO含む)が招聘され、現在のダバオ市廃棄物発電事業の進捗状況についてヒアリングがあるとともに、廃棄物発電事業を実施する上でのフィリピン国内での課題などについて関係者からヒアリングが行われた。

ODA 案件の FS 調査

調達代理機関によるダバオ市廃棄物発電事業実施に関する実施可能性調査が行われた。調査内容については、ダバオ市や財務省(DOF)をはじめとする関係機関と共有されており、最大の懸念事項であった事業採算性について、実施機関であるダバオ市が、本事業のViability Gap分についてDENRの補助金を申請し、事業性を確保する方針で合意された。

WtE事業の実施体制図案は下図の通りである。日本側の民間事業者は日鉄エンジニアリング株式会社を想定している。



図18 廃棄物発電(WtE)事業の実施体制図案

WtE事業のJCM設備補助事業申請に向けた課題として、特に今後下記の項目について検討・整理することが必要である。

- ダバオ市による WtE 事業発注のタイミングと SPC 設立のタイミング

ダバオ市によるWtE事業発注のタイミングがJCM設備補助事業の公募・採択決定のスケジュールと合致しなければならないという懸念があったが、本年度から補助金の公募が通年となったことから、本懸念事項が緩和された。

ただし、JCM設備補助事業の仮採択後から設備補助の交付決定を受けるまでの3ヶ月の期間内に、ダバオ市によるWtE事業の受注者（後掲のSPCを組成する企業）が決定するとともに、当該SPCから対象設備の発注がなされる必要がある。

また、ダバオ市によるWtE事業の落札前にJCM設備補助事業に応募することになるが、仮採択前の時点で受注が確実であることを明確にしなければならない。

- 対象設備に関するエンジニアリング業務

対象設備のエンジニアリング業務に関する費用は交付決定前の費用は補助対象とならないところ、交付決定までエンジニアリング業務を実施しないことは工程遅延につながるため、一定の費用を補助事業の対象外とせざるを得なくなることから、WtE事業の発注のタイミングとの整理が必要である。

廃棄物発電事業におけるMRV方法論については、ミャンマー国ヤンゴン市における廃棄物発電事業がJCM設備補助事業として採択されていることから、その事業のMRV方法論を参照する。

リファレンス排出量は、焼却処理される廃棄物の量とその組成、及び焼却発電設備から系統に供給される電力量から算定する。埋立地(SWDS)からの排出量は一次減衰(FOD)モデルを使用して算定する。系統電力からの排出量は、系統に供給された電力量に系統電力の排出係数を乗じることにより算定する。

プロジェクト排出量は、施設の稼働開始時に用いる化石燃料の燃焼に伴う排出量、化石燃料由

来の廃棄物(プラスチック等)の燃焼に伴う排出量を算定する。更に、焼却ガス中に含まれるN₂OとCH₄もプロジェクト排出量として算定する。

モニタリングパラメータは下記のとおり。

- 廃棄物発電施設へ投入する廃棄物の組成と量
- 化石燃料消費量
- 系統への供給電力

排出削減量試算にあたり、現況から想定される条件は以下のとおりである。

表6 排出削減量試験における想定条件

項目	数値
廃棄物発電施設 処理能力	600t/日
年間稼働時間	7,440 時間(310 日間)
年間発電量	87,048MWh
年間売電量	74,688MWh
系統電力の排出係数(ミンダナオ島の全電源平均)	0.163 t-CO ₂ /MWh

(1)リファレンス排出量(期間 p におけるリファレンス排出量[tCO₂/p])

$$RE_p = RE_{CH_4, SWDS, p} + RE_{elec, p}$$

$RE_{CH_4, SWDS, p}$ 期間 p に SDWS おけるごみの分解からのリファレンス排出量 (tCO₂/p)

$RE_{elec, p}$ 期間 p におけるグリッド電力からのリファレンス排出量 (tCO₂/p)

(2)プロジェクト排出量(期間 p におけるプロジェクト排出量[tCO₂/p])

$$PE_p = PE_{FC, p} + PE_{COM_CO_2, p} + PE_{COM_CH_4N_2O, p}$$

$PE_{FC, p}$ 期間 p の化石燃料消費からの CO₂ 排出量 (tCO₂/p)

$PE_{COM_CO_2, p}$ 期間 p の化石燃料由来廃棄物の焼却による CO₂ 排出量

$PE_{COM_CH_4N_2O, p}$ 期間 p の焼却排ガス中に含まれる温室効果ガス排出量 (tCO₂/p)

(3)排出削減量

$$ER_p = RE_p - PE_p$$

IV. セミナーへの参加

1. 都市間連携セミナーと北九州市への招聘

2020年1月16日、17日に東京都で開催される都市間連携セミナーに合わせ、ダバオ市から北九州市へセバスチャン・ドゥテルテ（Sebastian Zimmerman Duterte）副市長とメルチョア・キタイン（Atty. J. Melchor B. Quitain）市議会議員を招聘した。

セバスチャン・ドゥテルテ副市長は2019年5月の選挙でダバオ市副市長に初当選し、次期ダバオ市長の最有力候補と目されており、現在もサラ・ドゥテルテ市長が市外での公務のため不在中には臨時市長を務めている。また、キタイン市議は、現在、ダバオ市議会の議会運営委員長、立法委員長を務め、ダバオ市議会ではリーダー格の有力市会議員である。キタイン市議は以前より北九州市との連携事業に関心が高く、北九州市の廃棄物発電施設や省エネ設備の視察を希望していたことから、今回の招聘者に選定された。

このハイレベルの2名を含むダバオ市からの招聘団が、2020年1月13日～15日に北九州市を訪問し、パートナー都市の政策と施策を学び、そして関係者間での協議を行うことで、都市間のパートナーシップ強化を図ることを計画していた。特に、都市間連携事業の現況や廃棄物発電事業等に関する理解を深めていただく予定であった（日程表、招聘予定者一覧については下図を参照）。

しかし、1月12日にルソン島にあるタール火山が噴火したことでマニラのニノイ・アキノ国際空港が、同日夕方から封鎖された。そのため、翌日13日のダバオからマニラ、マニラから福岡への航空便が全てキャンセルとなり、またその後の航空便の運航状況が不透明な状況から、招聘団の安全性が確保できないとの判断により、ダバオ市からの招聘団の来日は全てキャンセルとなった。（参考資料13参照）。

都市間連携セミナーでは、ダバオ市との連携事業について北九州市より発表を行った（参考資料14参照）。

表7 ダバオ招聘団行程予定表

日時	行程
1/13(月・祝) 06:15-08:10 09:45-14:15 15:30 17:00	ダバオ→マニラ(PR1810) マニラ→福岡(PR426) 福岡国際空港から北九州市へ移動 リーガロイヤルホテル 着 スケジュール等の事前説明
1/14(火) 09:00-10:00 10:30-11:00 11:30-12:45 13:00-13:40 14:00-15:00 15:30-16:30 18:30-20:30	ダバオ市と北九州市の都市間連携事業の概要説明(リーガロイヤルホテル会議室) ごみ収集現場視察,(北九州市八幡西区桃園エリア) 昼食 本城かんびん資源化センター視察 皇后崎清掃工場視察 ひびき灘最終処分場視察 歓迎夕食会(他アジア都市と合同)
1/15(水) 09:30-10:30 11:00-11:30 12:30-13:30 13:45-14:15 16:20-17:50	環境ミュージアム視察(他アジア都市と合同) 日鉄エンジニアリング戸畑技術センター訪問 北九州市長との昼食会(北九州市主催) 北九州市議会表敬訪問 北九州空港へ移動 北九州→羽田(SFJ86) 品川プリンスホテル 着
1/16(木) 9:00-12:00 12:00-14:00 14:00-17:00	都市間連携セミナー:非公開セミナー①(会場:品川プリンスホテル) 昼食 東京都内視察(環境関連施設)
1/17(金) 9:00-12:00 12:00-14:00 14:00-17:00	都市間連携セミナー:非公開セミナー②(会場:国際館パミール) 昼食 都市間連携セミナー:公開セミナー
1/18(土) 15:20-19:30 22:15-00:05 ⁺¹	ホテルチェックアウト 羽田国際空港へ移動 羽田→マニラ(PR421) マニラ→ダバオ(PR2825)

表8 招聘予定者

	Name(名前)	Organization(所属組織)	Position(役職)	備考
1	Mr. Sebastian Zimmerman Duterte セバスチャン・ジーマン・ドゥテルテ	Davao City Government ダバオ市政府	Vice Mayor 副市長	
2	Mr. J. Melchor JR. Bumpus Quitain J.メルチョア・Jr. ブンパス・キタイン	City Councilor of Davao ダバオ市議会	City councilor 市議	
3	Ms. Diana Ann Welborn Quitain ダイアナ・アン・ウェルボーン・キタイン	Office of Atty. Quitain, City Councilor of Davao キタイン市議事務所	Chief of Staff 室長	自費参加 予定
4	Mr. Vince Jul O. Malicay ヴィンス・ジュル・O. マリカイ	Office of Vice Mayor of Davao ダバオ副市長室	Executive Assistant of Vice Mayor Duterte ダバオ副市長 エグゼクティブ アシスタント	自費参加 予定

添付資料

- 参考資料 1: キックオフ会合用資料
- 参考資料 2: ステークホルダーワークショップ・プログラム
- 参考資料 3: ステークホルダーワークショップ・参加者リスト
- 参考資料 4: ステークホルダーワークショップ・発表資料
- 参考資料 5: ダバオ市温室効果ガスインベントリー(GHGI)レポート
- 参考資料 6: ステークホルダー会合で集約された緩和策リスト
- 参考資料 7: LED 技術仕様内容
- 参考資料 8: ダバオライト社による LED(日本側提案製品)評価表
- 参考資料 9: ダバオ市における JCM 設備補助事業(LED 化事業)に関する発表資料
- 参考資料 10: JCM 応募相談・参画促進に関するヒアリングシート
- 参考資料 11: 廃棄物管理分野における日比協力枠組みについて(2019 年 8 月 2 日)
- 参考資料 12: 環境天然資源省(DENR)廃棄物発電事業の実施に関する省令
(DAONo.2019-21)
- 参考資料 13: 来日中止に係るダバオ市側からの公式レター
- 参考資料 14: 都市間連携セミナーにおける北九州市・ダバオ市連携事業発表資料
(2020.1.16)

City-to-City Collaboration Project between Davao and Kitakyushu

LCCAP development in FY2019 including GHG inventory & mitigation options

Junko Akagi
Research Manager
Kitakyushu Urban Centre

21 Nov. 2019



Outline of city-to-city collaboration program

-Basic concept is transferring the **knowledge and experience of Japanese cities for creating low carbon society** to foreign cities which have the mutual relationship.

-Private companies formulate the consortiums with Japanese cities and support foreign cities to create low carbon cities.

Ex) Support to design city masterplan and install low carbon technology etc.



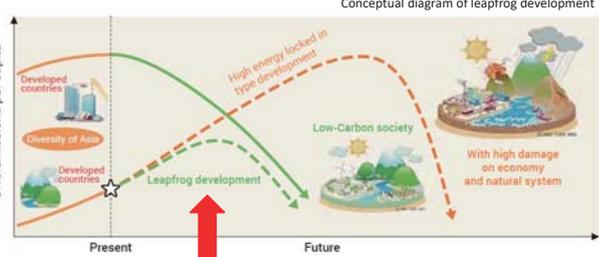
- **Creating low carbon project** efficiently and effectively
- **Designing the local systems** to promote low carbon society
Ex) low carbon action plan and technology evaluation criteria etc.
- **Capacity building** for local staffs

Promotion of private investment
Self-sustained development of foreign city
Transferring low-carbon technology to other fields

Source: MOEJ

Creating a low-carbon and sustainable society

Conceptual diagram of leapfrog development



Diffusion of **low-carbon technologies & environmental management know-how** accumulated in Japanese cities

Source: National Institute for Environmental Studies

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FY2019 Cities joining the city-to-city collaboration program by MOEJ

1. Ho Chi Minh City (Vietnam) – Osaka City
2. Bali City (Indonesia) – Toyama City
3. Hlegu township Yangon (Myanmar) – Kitakyushu City
4. Iskandar Development Area (Malaysia) – Kitakyushu City
5. Bangkok and Laem Chabang (Thailand) – Yokohama City
6. Yangon city (Myanmar) – Kawasaki City
7. Can Tho city (Vietnam) – Hiroshima pref. government
8. Sagaing Region (Myanmar) – Fukushima City
9. Rokan Hulu Regency (Indonesia) – Kawasaki City
10. Kuala Lumpur City (Malaysia) – Tokyo Metropolitan Government
11. Davao City (Philippines) - Kitakyushu City
12. Quezon City (Philippines) – Osaka City
13. Hai Phong (Vietnam) – Kitakyushu City
14. EEC and Bangkok (Thailand) – Osaka City
15. Jakarta (Indonesia) – Kawasaki City
16. Ayeerwady (Myanmar) – Fukushima City
17. Semarang (Indonesia) – Toyama City

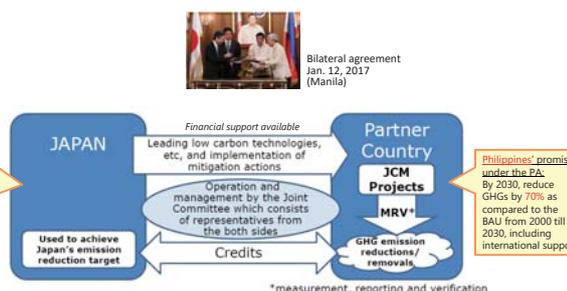


Source: MOEJ

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Mechanism for facilitating the diffusion

Joint Crediting Mechanisms (JCM)



Japan's promise under the PA: By 2030, reduce GHGs by 26% as compared to the 2013 level

Philippines' promise under the PA: By 2030, reduce GHGs by 70% as compared to the BAU from 2030 till 2030, including international support

Source: METI

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JCM City-to-city Cooperation Project between City of Kitakyushu and Davao City

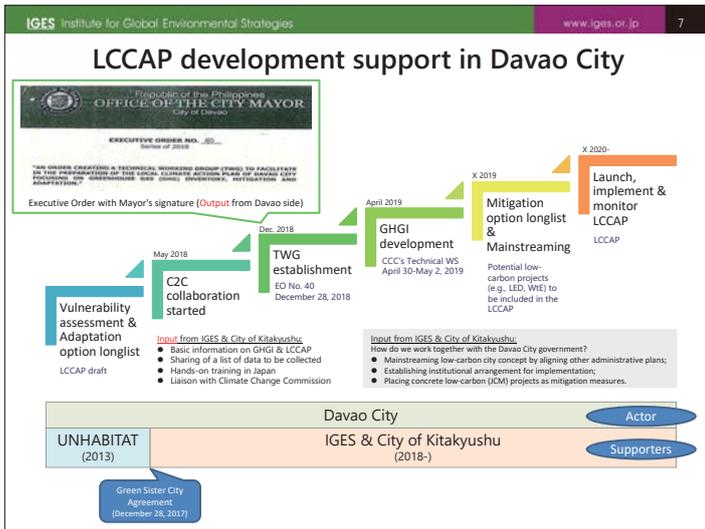
Project to realize low carbon society in Davao City through a support for a development of Local Climate Change Action Plan



Support & study items

1. Support for the development of Local Climate Change Action Plan (LCCAP) of Davao City
2. Study on the applicability of JCM model project to the Waste-to-Energy (WtE) project
 - NIPPON STEEL ENGINEERING CO., LTD.
3. Feasibility study on the LED streetlight conversion project
 - DHOWA TECHNOS Co., Ltd., JOIN PLANNING Co., Ltd.
4. Feasibility study on the EV bus and renewable energy projects
 - SoftEnergy Controls Inc., KYOWA ENGINEERING CONSULTANTS Co., Ltd.

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C2C Seminar in Tokyo (16-17 Jan 2020, Tokyo)

Organizer: Ministry of the Environment of Japan & IGES

Participants: Participants of the FY2019 C2C Projects

- About 80 people for the closed seminar
- About 150 people for the open seminar (17th PM)

Purpose: To share and disseminate the progress made by each project

From Davao City, Vice Mayor and his chief staff will attend the seminar. (They will visit Kitakyushu prior to the seminar.)

They are requested to make a **5 min. presentation on our project:**

- ✓ Overview of the C2C project and expected outcome;
- ✓ Progress made for the development of LCCAP and low-carbon projects;
- ✓ Roles played by the Davao City government in the C2C project;
- ✓ Challenges faced by the Davao City government for creating low-carbon and sustainable society.

Activities under the FY2019 C2C project

1. Completion of Davao City's GHG inventory & documentation
2. Creating a longlist of mitigation options based on:
 - municipal administration goals (CDP, CLUP)
 - GHG inventory
 - F/S under the C2C Project (e.g., WtE, LED)
 - SDGs
3. Update adaptation plan, as necessary

Develop draft components of the LCCAP

Discussion point for today

- Stocktaking
- Do you agree with the suggested actions for FY2019?
 - ✓ How can we document the GHG inventory results?
 - ✓ How can we create a longlist of mitigation options?
- How can we support you to develop the LCCAP? Do you have any requests to the "Team Kitakyushu"?
 - ✓ Local consultant will be hired based on the request FY2018.

Schedule for the FY2019 C2C project

	FY2018	FY2019				FY2020
		Nov	Dec	Jan	Feb	
LCCAP TWG established	■					
CCC's GHGI workshop	■					
Preliminary GHGI results		■				
Completion of GHGI		■	■			
Documentation of GHGI (local con.)			■	■		
C2C seminar in Tokyo (Vice Mayor)				■		
Mitigation options consideration		■	■	■		
Documentation of mitigation options (local con.)					■	
Update of adaptation options						■
Documentation as LCCAP						■
LCCAP finalization						■

Expected output for FY2019: (1) GHGI report, (2) Longlist of mitigation options

PROGRAMME

Formulation of Local Climate Change Actions for Davao City

January 30-31, 2020

Venue: Malayan Colleges Mindanao, Davao City Campus

Day 1 Sessions - January 30, 2020

AGENDA

9:00 - 9:30	Preliminaries: Prayer and Philippine National Anthem; Davao Hymn	
	Inspirational Message	Davao City Local Chief Executive
	Welcome Address	Engr. Dodjie Maestrecampo EVP and COO Malayan Colleges Mindanao, A Mapúa School
	Rationale and Objectives of Davao City LCCAP Workshop	
9:30 - 10:00	Participants Introduction	Group Exercise - Mood setting
10:00 - 10:30	INPUT 1: Overview of the current Local Climate and Disaster Risk Situation <i>Understanding Climate Change (CC)</i>	Keynote: Atty. Rachel Ann Herrera, Climate Change Commissioner
10:30 - 11:00	INPUT 2: Sharing of Experience on Climate Change Mitigation Strategies: The Case of Kitakyushu City, Japan	Institute for Global Environmental Strategies (IGES): Mr. Shiko Hayashi, Director and Ms. Junko Akagi, Research Program Manager
11:00 - 11:30	INPUT 3: Interfacing Development Interventions for Sustainability's Experience in addressing climate change impacts and its causes in Davao City	Interfacing Development Interventions for Sustainability, Mr. Lemuel Ibanez - Manalo, Environmental Planner
	OPEN FORUM	
13:15 - 13:30	INPUT 4. Legal Bases of CCA/ DRR Initiatives: Why do LGUs need to formulate a Local Climate Change Action Plan?	Atty. Mark Penalver, IDIS Coordinator
13:30 - 14:30	WORKSHOP A.2 - Next Steps	Workshop

2020.01.29 version

14:30 - 15:30	INPUT 5: A review and analysis of Davao City's situation and assessment: 4.1 Climate Change Vulnerability and Risk Assessment 4.2 GHG Inventory results and Review of Current Mitigation Actions	Dr. Gernelyn T. Logrosa, Malayan Colleges Mindanao Dr. Doris Montecastro, Ateneo de Davao University
OPEN FORUM		
16:00-16:30	Synthesis - key actions - Commitments	

Day 2 - January 31, 2020

Mapping of Strategic Options and Priorities

AGENDA

9:00 - 9:30	Recap	
9:30 -10:30	Step 1: Review of Development Goals; Setting Objectives and Strategies for Climate Change Actions	Workshop and Plenary
10:30 - 12:00	Step 2: Options Identification	Workshop and Plenary
13:00 -14:00	Step 3: Options Assessment	
	Coffee Break	
14:30 - 16:00	Implementation: Putting it together and Presentation per sector	Plenary
16:00 - 16:30	OPEN FORUM	
16:30 - 16:45	Synthesis: Key Actions and Commitment	
Closing		



Republic of the Philippines
City of Davao

OFFICE OF THE CITY PLANNING AND DEVELOPMENT COORDINATOR



Davao City Local Climate Change Action Plan Workshop
Malayan Colleges Mindanao, A Mapua School
Mac Arthur Highway, Davao City
January 30, 2020, 8:00 a.m. – 5:00 p.m.

ATTENDANCE SHEET

No	Name	Offices/Agency	E-mail address	AM Signature	PM Signature
1	RAQUEL C. VILVA MUSA	MCM			
2	MERIAM P. UEDOPOLDO	MCM			
3	Nipa, Ireneo Jr	City Disaster			
4	Lokandina Orceillo	CENRO			
5	GONZALES, VENDEL M	CDRRMO			
6	FELINEE CABRERA	CENRO			
7	JASON HENDERUN	DENR-EMB RXI			
8	JALMAN P. SARIP	SANBENIGNIAN TRIBUNAL			
9	Liza Mac C. Villora	DENR-EMB RXI			
10	Maingolol P. Aranda	DOE-Mindanao			
11	Gonzales, Eddy M	CDU			
12	ROX ANTHONY DEIAS	SEN. LORENTO FOUNDATION (SALORSEDTI)			
13	ROY JOSE PASCUA	DEPT. OF AGRI			
14	Eduardo B. Perez	CITMLO			
15	Anthony Ray Caric	City Agri			
16	EDITO S MANDRI	CDRRMO			
17	ROMEO LINTAPRU	CPDO			
18	KARINA CAÑEDO	CPDO			
19	KHIMBERLY ALBANO	CPDO			
20	GAMALATI, MACK ARTHUR C.	DepEd - Davao			
21	MISA, MARIA LOURDES D.	CPDO			
22	LORA, RUBY ROSE L.	CPDO			
23	Casan, Jamalia A.	ADDU			
24	REBUTA, MICHAEL	CEO			
25	LEMUEL MAMAO	DIS			
26	JOSIE E MAMAC	DCWD			
27	GONZA, CRISTIL F.	CENRO			
28	MISED, VIRGENIA A.	CENRO			
29	Redijo, R. Daryl	CDRRMO			
30	Mary Ann V. Fuster				



Republic of the Philippines
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ATTENDANCE SHEET

No	Name	Offices/Agency	E-mail address	AM Signature	PM Signature
31	DIONISIO GONZALEZ	DLPC		[Signature]	[Signature]
32	DANTE BORINAGA	DLPC		[Signature]	[Signature]
33	Jennifer P. Manial	NCIP- RXI		[Signature]	[Signature]
34	SALVO, LEE JESSICA	DPWA XI		[Signature]	[Signature]
35	VILLOCINO, KELVIN V.	DPWH XI		[Signature]	[Signature]
36	ACANES Co. ANDRES	CVO		[Signature]	[Signature]
37	Samson P. Inop (double)	GREENHAWK TRAINING		[Signature]	[Signature]
38	Beie Kasunaya Gabon Atega	World Peace Committee		[Signature]	[Signature]
39	Marycon Delos Reyes	MCM		[Signature]	[Signature]
40	Mio Nogawa	APLA		[Signature]	[Signature]
41	CHINKIE COLVE	DIS		[Signature]	[Signature]
42	Lelaine Joan alfecthe	MCM		[Signature]	[Signature]
43	Maria Fabe T. Bibe	DAXI		[Signature]	[Signature]
44	JOHN BAYNOSA	DCWD		[Signature]	[Signature]
45	KERYL JOYCE PAHAYAC	MCM- CCO		[Signature]	[Signature]
46	KATEL EMYCA NAONGI	MCM - CCO VOLS		[Signature]	[Signature]
47	ABDULJALIL ABDULBAJIT	MCM-CCO-VOLS		[Signature]	[Signature]
48	GERTIE QUIJADA	CCO-MCM		[Signature]	[Signature]
49	BEA ABIGAIL LEDNCITO	CCO-MCM-VOLS		[Signature]	[Signature]
50	BARDE, LAKISSA MARIE M	CCO-MCM		[Signature]	[Signature]
51	CUEZON, Astrid A.	CCO-MCM		[Signature]	[Signature]
52	Dosalla, Dan M.	CCO-MCM-VOLS		[Signature]	[Signature]
53	CELELYN B PINILI	City Act.		[Signature]	[Signature]
54	Loraida P. Fabro	CPDO		[Signature]	[Signature]
55	Ian Garcia	SALIGAN		[Signature]	[Signature]
56	Bong Villardo	USEP-SOL		[Signature]	[Signature]
57	Rebay, Dave John B.	MCM		[Signature]	[Signature]
58	RUTH G. JABINES	DCWD		[Signature]	[Signature]
59	ANJI LAURA GRECIA-LORONA	DCWD		[Signature]	[Signature]
60	ELVEN S. APOK	DCWD		[Signature]	[Signature]



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ATTENDANCE SHEET

No	Name	Offices/Agency	E-mail address	AM Signature	PM Signature
61	Dam Vertido	Mindanao Law			
62	Carmela "mylai" Santos	Ecotenco - Davao			
63	ROAN R. BASKON	algaw@lo.boqs.gov.ph			
64	IDMKS KUANCOYA				
65	Jully Ann E. Ugarn	IDIS			
66	Thelma S. UOOD	BANTAY BUKID			
67	Frederick E. Pater	Bantay Bukid			
68	Johny B. Rabapan	Bantay Bukid			
69	MARIE EGENTIN	PHIL. EMBLEF			
70	AL-JIM PALMA	SEA-ADDU			
71	VICTORIA I HORETIL	GUIDE INC			
72	NORTA VARELLANA	TANBAYAN			
73	ARNOLD VANDERBURE	IDIS			
74	LEANDRO S. ESCALARA	MASIPAG			
75	MICHAEL G. CAMBA	MCA			
76	John James S. Enig	sr staff			
77	PIERRE JOHN B. YUMALUE	CPDO-PPD			
78	ALBERT E. MANULAT	CPDO-PPD			
79	Geina R. Santos	CPDO			
80	Eni John S. Demsem	CPDO			
81	Jo Ann L. Esquerrol	PMED			
82	EDWIN G. BACALSO JR.	PMED			
83	MARVIC O. GUBALANE	PMED			
84	MARY JOY D. TURKEMOCHA	CPDO			
85	ATMEL C. Lido	CPDO			
86	Acater, Lorella	CPDO			
87	JASON CHINCENTIC	CPDO			
88	ERIC PAXE	CPDO			
89	AQUILAN, RONN MARIC	CPDO			
90	MAM C. CORTER	CPDO			



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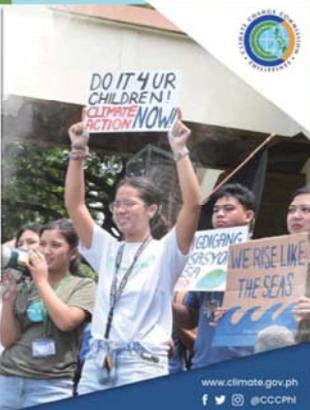
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ATTENDANCE SHEET

No	Name	Offices/Agency	E-mail address	AM Signature	PM Signature
91	Felices, Ruel Kenneth A.	IDLS	[REDACTED]	[Signature]	[Signature]
92	Estela D. Malate	CPDD		[Signature]	[Signature]
93	Mary Libeth Singlo	CPDD		[Signature]	[Signature]
94	Felipe T. Adoramos	IDIS		[Signature]	[Signature]
95	ASTRIO CUEZON	MCM		[Signature]	[Signature]
96	ANGULO CAMPOS III	SP		[Signature]	[Signature]
97	DORIS B. MONTECASTRO	ADDU		[Signature]	[Signature]
98	ROMEL MENDOZA RUIZ	DCWD		[Signature]	[Signature]
99	MINERVA R. GUEVARA	CPDD		[Signature]	[Signature]
100	Jane Monton	CPDD		[Signature]	[Signature]
101	Arcel D. Loguinas	PEP	[Signature]	[Signature]	
102					
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How can you help fight CLIMATE CHANGE?

Formulation of Local Climate Change Action Plan for Davao City

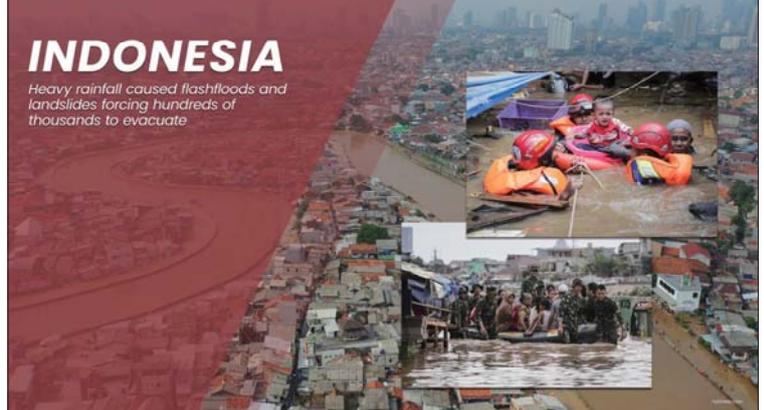


COMM. RACHEL ANNE S. HERRERA
Climate Change Commission (CCC)
Keynote Speech
January 30, 2020

www.climate.gov.ph
f t i @CCCPH

INDONESIA

Heavy rainfall caused flashfloods and landslides forcing hundreds of thousands to evacuate



CLIMATE CHANGE is the greatest threat faced by this generation



AUSTRALIA

Severe drought ignited bushfires across the country

More than **6.3 Million** hectares of bush and forests burned

Estimated **1 Billion** animals have died



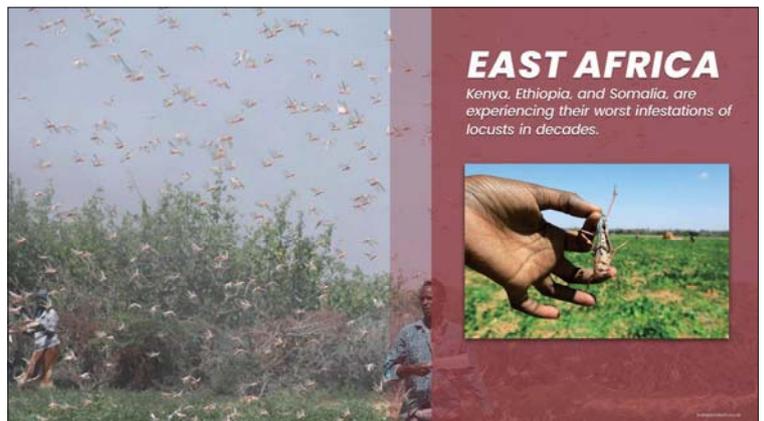
TYPHOON URSULA DAMAGES

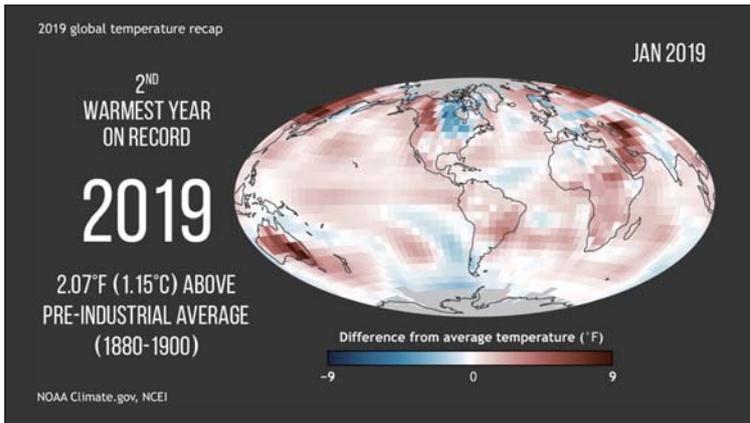


	783,000 people affected
	P4.38 Billion estimated cost of damage to infrastructure & agriculture
	57 people dead

EAST AFRICA

Kenya, Ethiopia, and Somalia, are experiencing their worst infestations of locusts in decades.





THE PHILIPPINES

Experiencing a continuous decline in biodiversity due to unsustainable land conversion, deforestation, and pollution.

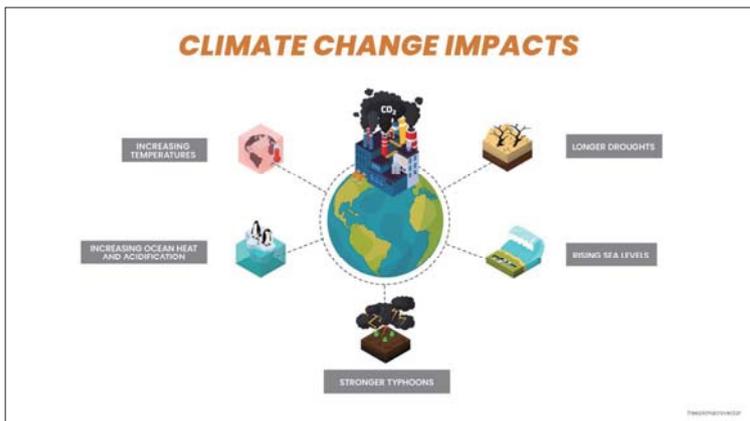


2017 PHILIPPINE CLIMATE CHANGE ASSESSMENT

➔ Climate change induced variability in rainfall is likely to have the greatest impact in the country.

2017 PHILIPPINE Climate Change ASSESSMENT

IMPACTS, VULNERABILITIES AND ADAPTATION



2017 PHILIPPINE CLIMATE CHANGE ASSESSMENT

➔ Climate change induced variability in rainfall is likely to have the greatest impact in the country.

➔ Mindanao is shown to have a decreasing trend in rainfall.

2017 PHILIPPINE Climate Change ASSESSMENT

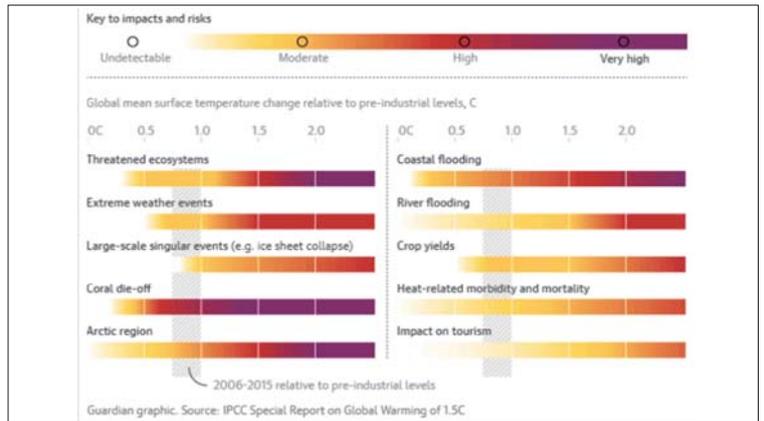
IMPACTS, VULNERABILITIES AND ADAPTATION

2017 PHILIPPINE CLIMATE CHANGE ASSESSMENT

- ➔ Climate change induced variability in rainfall is likely to have the greatest impact in the country.
- ➔ Mindanao is shown to have a decreasing trend in rainfall.
- ➔ Davao del Sur has been identified as one of the most vulnerable to drought and tropical cyclones.



Impacts, Vulnerabilities and Adaptation



2017 PHILIPPINE CLIMATE CHANGE ASSESSMENT

- ➔ Climate change induced variability in rainfall is likely to have the greatest impact in the country.
- ➔ Mindanao is shown to have a decreasing trend in rainfall.
- ➔ Davao del Sur has been identified as one of the most vulnerable to drought and tropical cyclones.
- ➔ Davao is listed as one of the top 25 cities with the largest population exposure to storm surges caused by strong winds from typhoons.



Impacts, Vulnerabilities and Adaptation




If we go business-as-usual, global temperatures are on track to increase by at least 3°C towards the end of the century.

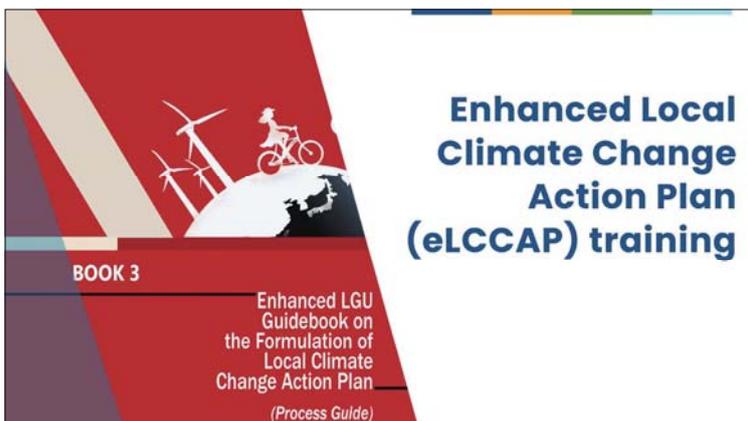
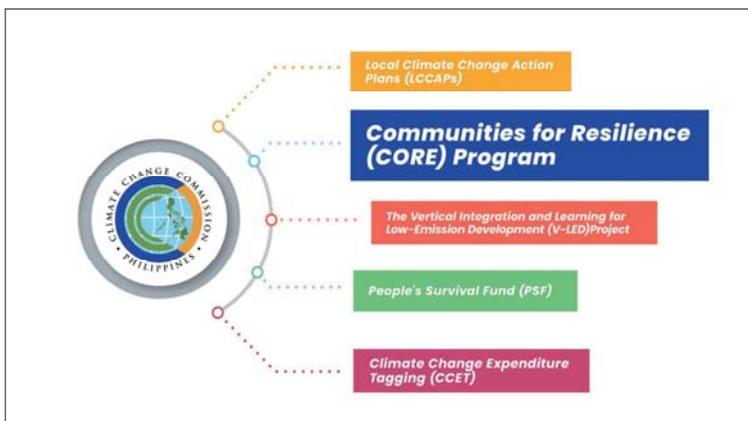
We only have until 2050 to ensure that the consequences of climate change will not be irreversible.



LOCAL GOVERNMENT UNITS (LGUs)

Our country's first responders and first lines of defense against climate change.







Future City Kitakyushu
City of Kitakyushu

**Sharing experience:
The case of Kitakyushu City in Japan**

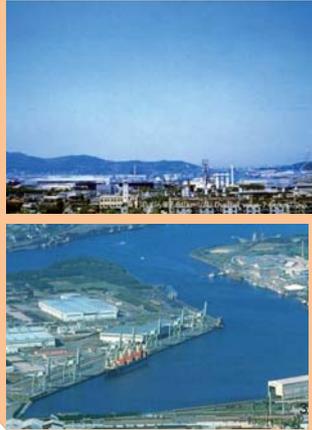
**January 30th 2020
IGES & City of Kitakyushu**

**Overcoming Severe Pollution:
Kitakyushu's Experience**

1960s



Today



3

City located near to other Asian nations, rich in nature, and developed as a manufacturing area



Population: 957,000 (2016)
Area: 491.95 Km²
GDP: 3,366 billion yen (2013)

Major companies in Kitakyushu area








Rich nature and branded food materials









1

Experience in Overcoming Pollution Problems



Company inspections



Self-produced Films



Residents

Partnership



Companies



Local Government



Anti-Pollution Agreements



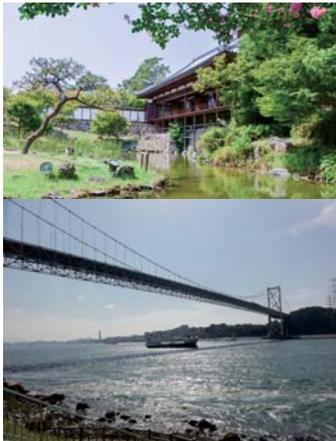
Environmental monitoring and environmental infrastructure development

Introduction of energy-saving production processes and pollution control equipment

2

Kitakyushu City With Long History





2

Kitakyushu Asian Center for Low Carbon Society

Center established as engine for green growth activities

Concept : Developing interactions that place value on the relationship between cities and that will help Japan gain respect from international society in order to contribute to the creation of green cities in Asia



Compile the experiences and know-how of the city from the process of overcoming pollution and becoming an environmental city in order to Create the "Kitakyushu Model"

192 projects in cooperation with 106 Japanese companies and universities in 80 Asian cities

5

Signing of a Memorandum of Understanding for a Green Sister City Relationship with Davao, The Republic of the Philippines

On November 28th, 2017, the City of Kitakyushu and the City of Davao, in the Republic of the Philippines, signed a Memorandum of Understanding creating a Green Sister City relationship between the cities that aims to create cooperative partnerships in the environmental field for the purpose of expanding mutual benefits and positively driving development through low-carbon societal initiatives, resource circulation projects, and development of local human resources.

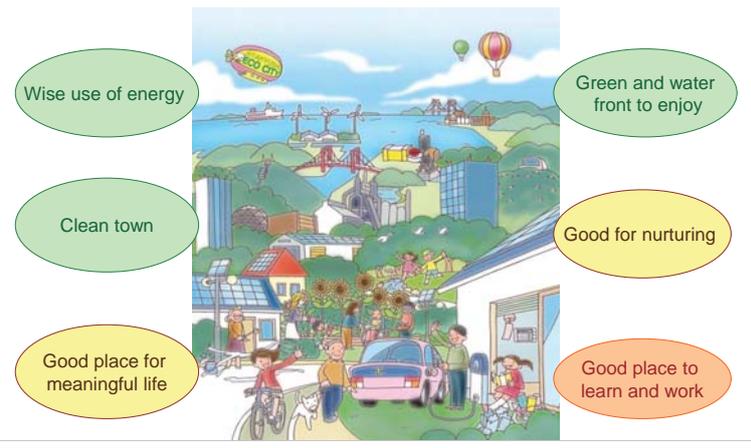
The City of Davao is the City of Kitakyushu's second Green Sister City, and its first since Surabaya in the Republic of Indonesia, in November of 2012. Through the signing of a Memorandum of Understanding, cooperation between the public and private sectors can strongly support the export of city infrastructure systems, create a path for regional revitalization, and drive national growth strategies.



Signing of the Memorandum of Understanding: Mayors Sara Duterte of Davao and Kenji Kitahashi of Kitakyushu

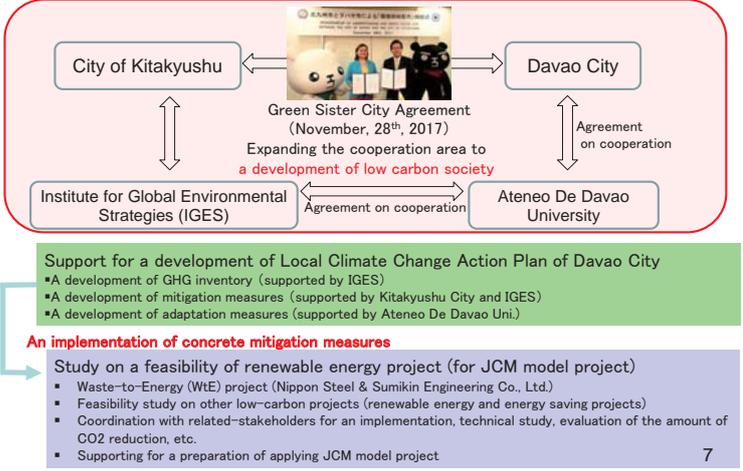
Kitakyushu's Proposal of Env' Future City

City where everyone wants to live, where every one is energetic

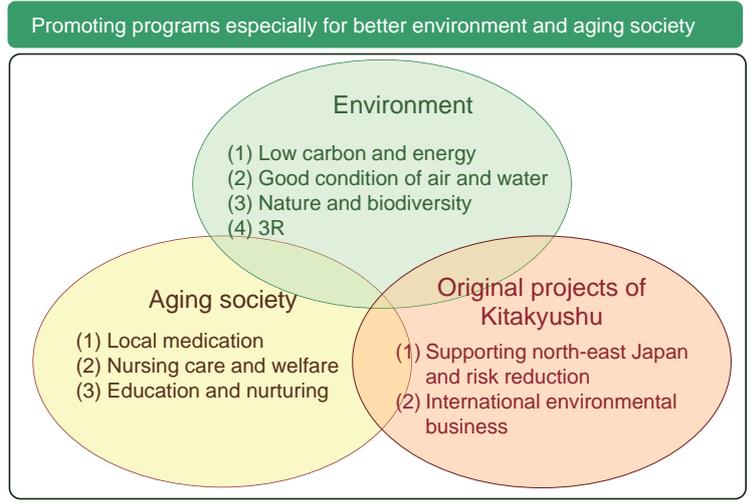


JCM City-to-city Cooperation Project between City of Kitakyushu and Davao City

Project to realize low carbon society in Davao City through a support for a development of Local Climate Action Plan (MoEJ : FY 2018)



Programs of Environmental Future City in Kitakyushu



Kitakyushu Environmental Future City

Five Policies to Achieve Targets

Environmental efforts creating an advanced city

- improve convenience of public transport
- Spread of the use of next-generation vehicles

Environmental efforts developing the economy

- Promotion of regional energy base
- Formation of an ozone-to-carbon advanced City project

Environmental efforts strengthening ties with Asia

- Promotion of the Asian Center for Low Carbon Development
- Promotion of the light projects by Asian nations on air pollution and energy saving measures
- Protection the Kitakyushu method for composting organic waste

Achievement of a low-carbon society

Environmental efforts developing human resources

- Community-based energy management
- Promotion of the creation of a hydrogen energy society
- Promotion of Education for Sustainable Development (ESD)
- formulation and establishment of the Kitakyushu City Environmental Capital Certification exam

Environmental efforts supporting rich, full lifestyles

- Enhancing Eco-life Stage
- Promotion of environmental activities through Tantan points
- Eco-Dive Kitakyushu Project

CO₂ Reduction Target

Action Plan "New Green Frontier Plan" (2016)

Medium-term target Up to 2030

Target of greenhouse gas reduction:
30%, 4.7 million ton (city area)
[Compared to the data of FY2005]



Long-term target Up to 2050

Target of greenhouse gas reduction:
50%, 8 million ton (city area)
150%, 23.4 million ton (Asia area)
[Compared to the data of FY2005]

Overview of the Kitakyushu Regional Energy Base Promotion Project

Potentials of the city

- Potentials as locations for renewable energy or high-efficient thermal power generation

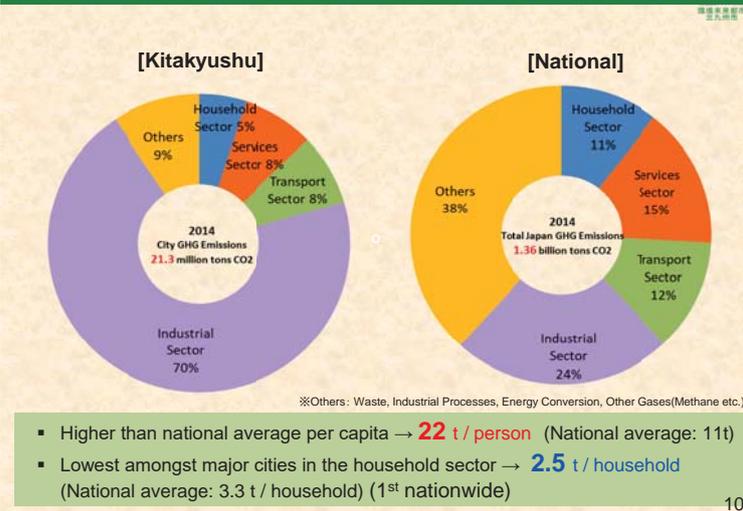
- Good wind conditions
- Presence of large-scale coal and LNG import bases
- Vast land



- Energy management know-how earned through the Smart Community demonstration



State of Greenhouse Gas Emissions



Integration of the Wind Power Generation Industry



Offshore Wind Power Firm (Under planning)

Operator: Hibiki Wind Energy Co., Ltd.
No. of windmills: 44 (maximum)
Total investment: 175 billion yen
Project Schedule: 2017~ Environmental assessment
2022~ Start of construction

Program for Promoting the Establishment of a Regional Energy Base

Integration of the Wind Power Industry and Human Resource Development

- Accumulation of the maintenance and parts industry

Related industries: windmill parts, construction work, O&M, and commodity distribution
Number of parts: 20,000

Need for the Development of Human Resources in the Wind Power Industry

Development of human resources in the wind power industry through partnership with local universities

- * This fiscal year, the following will be carried out in cooperation with The University of Kitakyushu.
 - (1) Conducting lectures on wind power
 - (2) Conducting courses on wind power research



Ref: 'A Guide to an Offshore Wind Farm', The Crown Estate

Kitakyushu Next-generation Energy Park

As of March 2016(including those under planning)

The map displays the layout of the energy park with various facilities marked. Key locations include the Shraashima national Oil Storage Base, Hibikinada Energy Park, and the Eco-town Center. A legend at the bottom identifies energy sources: Coal, Steam turbine cogeneration, Petroleum, Natural gas, Wind power generation, Solar power generation, Biomass, and Green Oil.

Kitakyushu City Energy Saving/Electricity Conservation Measures

Implementation of Heat Avoidance Areas in the City

Teitan Card

Show the card

Gifts

Category	Percentage
Air-conditioning	58%
Refrigerators	17%
Lighting	6%
TV	5%
Other	10%
Standby electricity	3%
Warm water toilets	0.6%
PCs	0.4%

Source: Agency for Natural Resources and Energy

Enlightening Activities

Kitakyushu City Energy Saving/Electricity Conservation Measures

Turning off of unnecessary lights by weeding out lighting and using power-off cords

Power-off cords

"Thank you for turning off." activity

Installed at 4,000 points of 8 institutions such as the main city hall and ward offices

Replacement with LED: 3,500 pieces at 126 institutions
Straight tube type: More than 240 pieces at 8 institutions

Kitakyushu City Energy Saving/Electricity Conservation Measures

[For citizens]

- Citywide posting of energy saving/electricity conservation posters
- Implementation of the Summer Energy Saving King contest
- Implementation of Heat Avoidance Areas in the City

[For companies]

- Implementation of energy saving/electricity conservation seminars
- Distribution of "Requests for energy saving/electricity conservation," a special edition of the Kaeru Press

The Hibikinada Area of Wakamatsu-ku, a General Center for Environmental Learning where the Environment and Industry are Fused

The three elements required for the creation of a sustainable society (low carbon, recycling and co-existence with nature) are arranged in a unified manner as a general center for environmental learning in the Hibikinada Area of Wakamatsu, where all three elements are present.

- Kitakyushu Eco-Town (formation of a recycling-based society, promotion of environmental industry)
- Next-Generation Energy Park (comprehensive development and exhibition of next generation energy to prevent global warming)
- The Hibikinada Birdsong Green Corridor, Japan's biggest biotope (co-existence of city and nature, creation of a pleasant relaxing space for people and animals)

Creation of a green corridor based on citizens' tree-planting

World's best eco-town

Introduction of fuel-cell vehicles

The City of Kitakyushu introduced fuel-cell vehicles (FCV) as the official vehicles and promotes them by having exhibitions and test-driving at various events.



Selected as SDGs Model City by OECD

April 2018:
First city in Asia to be selected as SDGs Model City by OECD

- * Other selected cities (as of April 2018)
Bonn (Germany), Tuscany (Italy), Friuli-Venezia Giulia (Italy), southern Denmark, Córdoba Province (Argentina)

June 2018:
Selected as SDGs Future City by Japanese government (Cabinet Office)

Carry out efforts for improving air quality as part of SDGs measures as well

Cooperation of city residents
Implementation of measures in other cities



Thank you very much!!



© Teitan & Teitan Black, City of Kitakyushu

ご清聴ありがとうございました!!

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Basic Concept of Joint Crediting Mechanism (JCM)

- Facilitating diffusion of **leading low carbon technologies, products, systems, services, and infrastructure** as well as implementation of mitigation actions of partner countries.
- Evaluating contributions from Japan to **GHG emission reductions or removals in a quantitative manner** by MRV.
- Contributing to achieve Japan's emission reduction target of the UNFCCC by facilitating global actions for GHG emission reductions.

17 Countries (signed with the Philippines in Jan 2017)

JAPAN JCM Financing Programme
Advanced low carbon technologies, etc., and implementation of mitigation actions
Management by the Joint Committee
Used to achieve Japan's emission reduction target
Credits

Partner Country
JCM Projects
MRV*
GHG emission reductions/removals

*measurement, reporting and verification
Source: Ministry of the Environment, Japan

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Study on possible application of JCM Model Project

Components will be checked for a feasibility study on low-carbon projects:

- Forming an **international consortium** including both a owner and user of the equipment, etc.
- Coordination on a **timing and condition** of a procurement of a low-carbon project in Davao City with related organizations, etc.
- Coordination with **manufacturers** of renewable energy equipment as well as **constructors**
- Selection of equipment**, calculate the amount CO2 reduction, support for a preparation to apply for JCM Model Project

Typical Project Structure

Ministry of the Environment Japan
Subsidy → GHG credit

JCM Consortium
Applicant (Japanese company) → Agreement of a consortium → Co-applicant (Local company)

Applicant:
Project Management
Reporting of GHGs emission reduction, etc.

Co-applicant:
Own equipment and operation and maintenance
Monitoring of GHGs emission reduction, etc.

Manufacturer of renewable energy equipment
Order → Engineering, procurement, trial operation, etc.

Constructor
Order → Installation and construction

Profit Exclusion

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Financing Programme for JCM Model Project

- Scope of the financing:
Facilities, equipment, vehicles, etc. which **reduce CO₂ from fossil fuel combustion** as well as **construction cost** for installing those facilities, etc.
- Eligible projects:
Starting installation after the adoption of the project and finishing installation **within three years**.

Partner Country → Credits → Japanese government & entities → Japan will acquire a part of JCM credits (in return to the financial support)

Incentivize selecting low-carbon technologies by the financial support to initial cost

Conventional equipment & facility: High GHG emissions, High Initial cost

Low-carbon equipment & facility: Lower GHG emissions, Lower Initial cost

Source: Ministry of the Environment, Japan

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Feasibility Study of LED Project

LED Ordinance (No. 0409-18, 2018)
Changing all street lights to LED

Davao City → Recovery of installation costs of LED by adding fees to electricity bills over years

JCM Model Project → Reduction of installation costs of LED

Davao City → Reduction of electricity bills which Davao City will pay to DLPC

Benefits to Davao citizens

Davao Light and Power Company (DLPC)

Picture: LED lighting for street lights (JOIN PLANNING Co., Ltd.)

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Possible ideas of low-carbon projects in Davao City

Possible **public** projects:

- Solar panel** on a roof of a public market located in Toril, Davao City
 - need to consult with MOEJ if it is regarded as a leading low-carbon technologies
 - The rate of a subsidy on an installation costs provided from MOEJ would be less than 50% (30 projects approved (2 in the Philippines) among 106)
- Exchange of street lights to LED lights**
 - need to further consult with Davao City and Davao Lights
 - If it is a public project, need a open tender (matters of schedule & selection)
- Introduction of a few **electronic buses** for the High Priority Bus System
 - There is a case introduced an electronic bus and electronic charging station under a C2C Collaboration Programme under Kitakyushu and Hai Phong, VN.

Possible **private** projects:

- Waste heat recovery-system** to a cement facility
- High-efficiency chiller** for air-conditioning to hotel or shopping mall, etc.
- High-efficiency boiler system** to factories, etc.

Note: You can check the past approved JCM Model Projects at <http://gpc.jp/jcm/projects/>

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Possible Project Structure

Boost local economy and produce a concrete outcome of C2C

MOEJ → Financial support → Kitakyushu City, IGES

Kitakyushu City → C2C → Davao City (Reduction of electricity bill)

IGES → LCCAP Implementation → Davao City

MOEJ → Support of implementation → Applicant (DHOWA TECHNOS Co. Ltd.)

Applicant → International Consortium → Co-applicant (DAVAO LIGHT)

Co-applicant → Installation of LED light and its smart system with lower cost

International Consortium → order → Manufacturer of LED light and equipment (JOINPLANNING Co. Ltd.)

International Consortium → order → Constructor (Local company)

Duration period: 15 years

* Excl. costs of removing current sodium lamps

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7

Calculation of GHG emission reduction

$$ER_p = RE_p - PE_p$$

ER_p	Emissions reduction during the period p (tCO ₂ /p)
RE_p	Reference emissions during the period p (tCO ₂ /p)
PE_p	Project emissions during the period p (tCO ₂ /p)

Criterion 1	The project installs LED street lighting system utilizing wireless network control, which is connected to an electricity grid system.
Criterion 2	All lighting equipment in one lighting system has the same specifications.
Criterion 3	Wireless network technology enables controlling of the volume of lighting.

$$RE_p = \sum_i P_i \times (\eta_{PJ,i} \div \eta_{RE}) \times PO_{i,p} \times EF_{grid} \times 10^{-6}$$

RE_p	Reference emissions during the period p (tCO ₂ /p)
P_i	Rated power consumption of a lighting equipment used in the project lighting system i (W)
$\eta_{PJ,i}$	Luminaire efficiency of a lighting equipment used in the project lighting system i (lm/W) 140
η_{RE}	Luminaire efficiency of the reference lighting system (lm/W) 62 (default)
$PO_{i,p}$	Total operating hours of project lighting system i during the period p (hrs/p) 4380 hrs/year
EF_{grid}	Grid emission factor of Mindanao grid (tCO ₂ /MWh) 0.286
i	Identification number of the lighting system

$$PE_p = \sum_i PEC_{i,p} \times EF_{grid} \times 10^{-6}$$

PE_p	Project emissions during the period p (tCO ₂ /p)
$PEC_{i,p}$	Total amount of electricity consumed in the project lighting system i during the period p (Wh/p)
EF_{grid}	Grid emission factor of Mindanao grid (tCO ₂ /MWh) 0.286
i	Identification number of the lighting system

GHG emission reduction: **2,193.26 t-CO₂/year**

Total GHG emission reduction (10 years): **21,932.6 t-CO₂**

Source: <https://www.icm.go.jp/kt-in/methodologies/34>





IDIS Proposed Climate Mitigation & Adaptation Measures for Davao City LCCAP

EnP. Lemuel Lloyd I. Manalo
Environmental Research Specialist, IDIS

Sustainable Development Goals

11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



- Climate Action which aims to “Take urgent action to combat climate change and its impacts.” Human Settlements need to strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries and more importantly to integrate climate change measures into national policies, strategies and planning.

IDIS is an environmental non-government organization registered with the Securities and Exchanges Commission (SEC) since 1999

- Policy Advocacy and Lobby
- Networking & Coalition Building
- Education & Information
- Media Advocacy & Public Awareness
- Research & Publication

IDIS | WHO WE ARE





Climate Change

“Refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere in addition to natural climate variability observed over **comparable time periods**”



United Nations Framework Convention on Climate Change (UNFCCC)

- ▶ **Climate Change** - the average weather conditions over a long period of time (typically 30 years, not limited to temperature rise)
- ▶ **Weather** - A specific meteorological event or condition that happens over a period of hours or days
- ▶ **Global Warming** – Recent and ongoing rise of earth's surface temperature caused by greenhouse gases in the atmosphere

Introduction

Davao City is one of the fastest growing cities in terms of population and economic hub for trade and industry. However, these leads to increased the amount of greenhouse gases, particularly carbon dioxide and increased atmospheric heat.

Climate Change is inevitable and have already caused a great impact to cities and human settlements, it will continue and will have an effect to both present and future generations. As such, there is a need to adapt and mitigate climate change the best stakeholders possibly can.



Proposed Matina Linear Park, McArthur Highway, Davao City

Climate Change Causes & Effects

Climate Change

Natural

- Volcanic Eruptions
- Ocean Currents/Tidal Changes
- Earth Orbital Changes
- Solar Variations

Anthropogenic

- Greenhouse Gas
- Deforestation
- Coal Mining
- Burning/Release of CO2
- Industrial Processes
- Agriculture

1. Rise of Sea Level
2. Heavy Rainfall and Wind
3. Extreme Drought
4. Decline in Crop Productivity
5. Changing Ecosystems & Species Depletion
6. Strong Hurricanes and Typhoons
7. Rise of Surface Temperature
8. Rise of Acidity in Freshwater & Seawater

NATURAL DISASTERS

Redefining Climate Mitigation & Adaptation

Mitigation

- ▶ actions that are taken to **reduce and curb greenhouse gas emissions**
- ▶ attends to the causes of climate change
- ▶ strategies to avoid the increase of pollutant emissions

Adaptation

- ▶ reducing vulnerability to the effects of climate change
- ▶ addresses the impacts brought about by Climate Change

Mitigation

- ▶ actions that are taken to **reduce and curb greenhouse gas emissions**
- ▶ attends to the causes of climate change
- ▶ strategies to avoid the increase of pollutant emissions

Adaptation

- ▶ reducing vulnerability to the effects of climate change
- ▶ addresses the impacts brought about by Climate Change

Review on GHG & Global Warming

- Water Vapor (H₂O)**
invisible state of water within the hydrosphere
- Carbon Dioxide (CO₂)**
chemical compound emitted when an organic material is burnt, occurs naturally in atmosphere as a trace gas
- Methane (CH₄)**
hydrocarbons that are the most potent of the greenhouse gases
- Nitrous Oxide (N₂O)**
colorless non-flammable gas, with a slight metallic scent and taste, often used in sedation process
- Ozone (O₃)**
a trioxxygen, an inorganic molecule that occurs both in the earth's upper atmosphere and at ground level

Greenhouse gases act like a blanket, absorbing IR radiation and preventing it from escaping into outer space.

The net effect is the gradual heating of Earth's atmosphere and surface, a process known as **global warming**.

Climate Change Causes & Effects

Climate Change Causes & Effects

- Natural**
 - Volcanic Eruptions
 - Ocean Currents/Tidal Changes
 - Earth Orbital Changes
 - Solar Variations
- Anthropogenic**
 - Greenhouse Gas
 - Deforestation
 - Coal Mining
 - Burning/Release of CO₂
 - Industrial Processes
 - Agriculture

MITIGATED

1. Rise of Sea Level
2. Heavy Rainfall and Wind
3. Extreme Drought
4. Decline in Crop Productivity
5. Changing Ecosystems & Species Depletion
6. Strong Hurricanes and Typhoons
7. Rise of Surface Temperature
8. Rise of Acidity in Freshwater & Seawater

ADDRESSED THROUGH ADAPTIVE INTERVENTIONS

Climate-Mitigation Measures

- **Green Growth** – Substantial reforestation & greening efforts both urban and rural areas, carbon sinks, declaration of local protected areas and sanctuaries
- **Infrastructure** – Promotion of Green & Energy-Efficient Designs, Green Buildings
- **Transportation** - Mass Transit and Carpooling System, Provision of infrastructure support for sustainable and non-motorized Transportation (EUVs, E-Bicycles, Cycling, Walking), Anti-Smoke Belching enforcement
- **Energy** - Provision of renewable energy and energy conservation initiatives
- **Waste** – Prohibition of open burning, incineration, closure of dumpsites, Full implementation of proper solid waste law and zero waste programs
- **Administrative**- Carbon Taxation and Off-setting, Polluter's Pay principle, Green procurement

Remaining Green Space in Fish Port Drive, Toril, Davao City

Mitigation Measures

Riverbank Trees along Crocodile Park, Davao River Davao City

Adaptation Measures

Climate Hazards in Davao City

1. Storms and Floods
2. Erosion and Landslide Susceptibility
3. Liquefaction Susceptibility and Earthquakes
4. Tsunami, Stormsurge and Sea Level Rise
5. Increasing Heat Temperature, Drought and Decline in Crop Productivity
6. Air Pollution, Smog and Haze

GEM Village, Maa, Davao City (2013)

1. Storms & Floods

Climate-Adaptive Interventions

- Preservation of Wetlands & Floodplains
- Riverbank stabilization through Bioengineering & Riparian Forestry
- Rainwater Harvesting
- Permeable Pavement System
- Drainage Systems Clearing
- Sustainable Urban Drainage System (SUDs)
- Stormwater/Flood Park Designs and Esplanades along Floodway Mitigation Zones

Hazard Risk Mitigation & Prevention

- Regulation on desilting and quarrying damage on riverbanks and increased risk of make-shift settlements

Matina Pangí Flooding Incident (June 2011)

- 10,000 homeless, 33 dead
- "The flooding problem is the most serious problem that must be addressed in an urgent manner." (page 334 of CDP).
- The biggest flood prone area is along the Talomo River covering Matina Pangí, Matina Aplaya, Langub, Magtuod, Ma-a and Talomo proper (almost 13,000 hectares)."
- Declared as the Most serious problem (page 381) that hinder the development of Davao City.

Decreasing Blue Spaces Wetlands in urban areas

Through Bing Satellite survey, researchers also found (2) large wetlands in major urban districts in Davao City which now have been developed for commercial-residential purposes by comparing 2015 and 2018 using historical satellite imagery.

Buhangin District, Davao City

Davao City Flood Susceptibility & Flood Mitigation Zone Maps

	Area (Has)	%
Low	9,929.82	4.07
Moderate	11,722.81	4.80
High	11,084.32	4.54
Very High	3,775.15	1.55
Unrated	207,487.91	85.04
Total	244,000.00	100.00

Davao City CLUP & Zoning Ordinance (2011-2022)

PRESEVING "BLUE SPACES" OR WETLANDS

Store surface water during the monsoons and ensure water availability in dry seasons for people, wildlife and nature.

Natural filters that trap solid and nutrient load, pollutants and sediments. Can improve water quality and reduce water treatment costs for cities.

Control floods by absorbing excess water and protect nearby settlements from flooding.

Green spaces for recreation and outdoor activities.

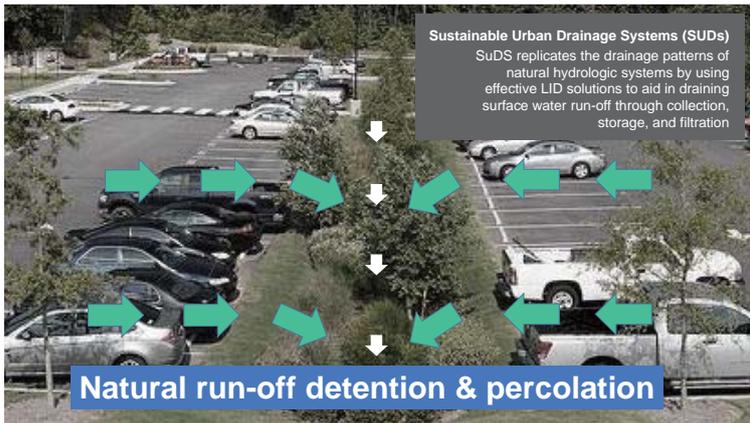
Carbon is stored in wetland sediment and dissolved in surface and groundwater from hydrocarbon deposits among local communities.

Natural habitats for flora and fauna breeding and migratory grounds for birds.

Wetlands is a distinct ecosystem that is flooded by water, either permanently or seasonally, distinguished with characteristics vegetation of aquatic plants adapted to unique hydric soil.

They serve essential functions including water purification, carbon sequestration, riparian stability, habitat and most especially flood mitigation.

A 500-sqm wetland with depth of 1 meter can hold up to 11,180 cu.m of run-off water



3. Earthquakes & Liquefaction

Floodwaters lubricate fault planes, erosion of landslides caused by the torrential rains acts to reduce the weight on any fault below, allowing it to move more easily. Rainfall also influences the pattern of earthquake when prodigious quantities of rain soak into the lowlands. This annual rainwater loading and unloading of the crust is mirrored by the level of earthquake activity. - Wdowski, 2015

Climate-Adaptive Interventions

- Establishment of Open Spaces as evacuation areas
- Infrastructure and Building Standards Upgrade; use of disaster-resilient designs and materials

Hazard Mitigation & Prevention

- Considering of high liquefaction areas and fault lines as basis for planning and building standards
- Pre-requirement of evacuation plans and access

Eco4000, Matina, Davao City (2019)

2. Erosion & Landslides

Climate-Adaptive Interventions

- Massive Reforestation and Greening Sloping Terrains
- Establishment of Buffer Zone Greenbelts
- Bioengineering Methods for Slope and Cliff Erosion Control

Hazard Risk Mitigation & Prevention

- Total prohibition of earth-fill and limestone quarrying at identified High Susceptibility areas
- Declaration of more Urban Ecological Enhancement Sub-Zones due to high susceptibilities on erosion and landslide

4. Tsunamis, Stormsurges & Sea Level-Rise

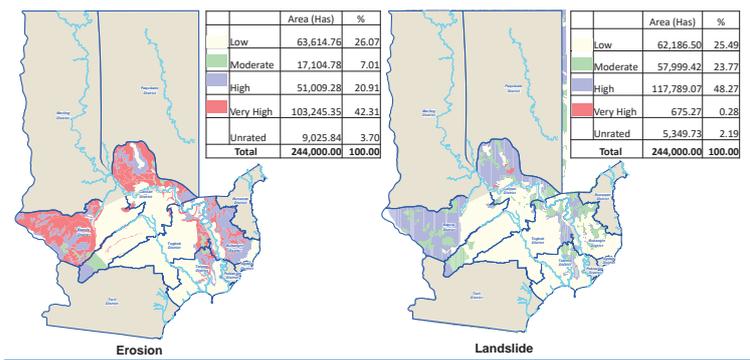
Climate-Adaptive Interventions

- Delineation and declaration of more Marine Protected Areas (MPAs)
- Mass Mangrove Reforestation and Coastal Rehabilitation
- Protection of Coastal Wetlands
- Establishment of New Mangrove Rehabilitation Sites

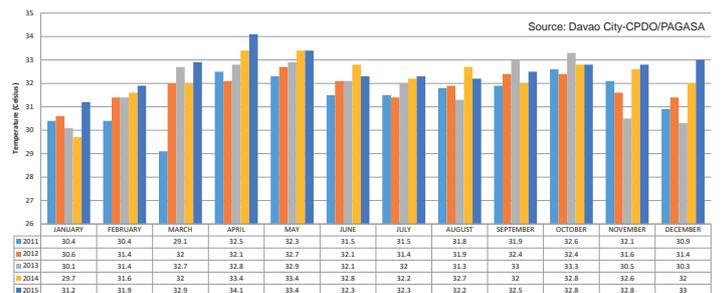
Hazard Mitigation & Prevention

- Decline Large Reclamation Projects for new settlement
- Relocation of settlements at vulnerable areas

Davao City Erosion & Landslide Susceptibility Maps



Davao City Atmospheric Temperature 2011-2015 (°C)



▶ 4th City with Highest Heat Index in PH (March 19, 2019)



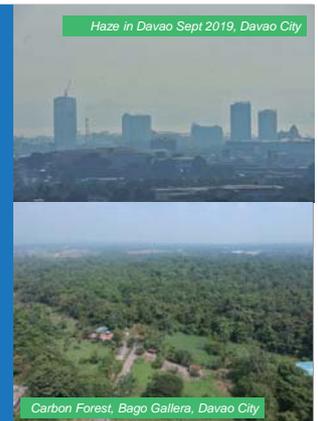
6. Air Pollution, Smog & Haze

Climate-Adaptive Interventions

- Establishment of vegetative buffer zones and greenbelts in conflicting zones
- Requiring of carbon & pollution sinks for industrial plants and areas
- Permeable pavements and surfaces

Hazard Risk Mitigation & Prevention

- Revival and installation of more Air-Quality Monitoring boards



5. Temperature Increase & Droughts

Climate-Adaptive Interventions

- Enhancement of urban greenery, parks and vegetated streetscapes and park connectors
- Requirement of green building designs; prioritizing ventilation and cooling
- Building Height Limitations for Urban Ventilation
- Urban Roof Gardening, Community Garden, Container Gardening
- Use of permeable pavements and surfaces
- Changing to heat tolerant tree or crop varieties
- Brightening of public roads and alleys through LED-Lights

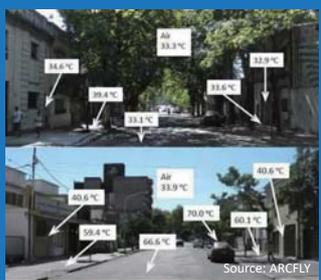
Hazard Risk Mitigation & Prevention

- Securing efficient forestlands and agricultural areas from numerous appeals for land reclassification



Green Streetscapes to Combat Urban Island Heat Effect (UHI)

- ▶ UHI affect settlements by increasing air conditioning costs, air pollution and greenhouse gas emissions.



Developing a Sustainable & Disaster-Resilient City

Mitigation - Adaptation

- Carbon Taxation and Off-setting System
- Massive Greening & Reforestation Programs
- Promotion of Green & Energy-Efficient Designs
- Mass Transit & Sustainable Transportation
- Renewable Energy
- Implementation of Zero Waste
- Green Procurement & Lifestyle

- Wetlands & Floodplains Preserved
- Resilient and Disaster-Proof Infrastructure Designs
- Bioengineering & Biophilic Designs
- Sustainable Urban Drainage Systems
- Rainwater Harvesting & Permeable Surfaces
- Land-Use Planning
- Maintenance & Sustainability
- Mangrove Reforestation and Coastal Wetlands
- Buffer Zone Green Belts
- Urban Greenery & Heat Tolerance
- Low-Impact Developments (LID)

Carbon Emissions & GHG

Geo-Hazards & Disasters

SUSTAINABLE CITIES & MUNICIPALITIES CHECKLIST

- ☑ Sufficient Urban Greenery Parks and Open Spaces
- ☑ Climate-Adaptive and Resilient Building Designs
- ☑ Rainwater Harvest and Use
- ☑ Adequate Permeable Surfaces and Effective Drainages
- ☑ Protection of Urban Wetlands and Ecological Areas
- ☑ Citizens Farm through Urban Gardening
- ☑ Zero Waste & Plastic-Free Oriented Communities
- ☑ Switching to Sustainable Transportation Alternatives
- ☑ Safe Access for Citizens with Special Needs
- ☑ High Citizen Participation in City Planning





People should be the center of all mitigation and adaptation measures, aiming for high-quality living, adequate resources, safe and resilient human settlements in Davao City

Overall Recommendations

- Research and data availability as part of the outputs and targets in the action plan; (e.g resource threshold basis of desilting projects and commercial quarrying, atmospheric heat index and mapping, river braiding, GHG emissions mapping & inventory).
- Collaborating with Local Resource Institutions (LRIs), academe and other partners in the Civil Society Organizations in the city.
- Intensification, implementation and allocation of funds for Community Based Monitoring (CBMS) must be included in the target actions.
- Transparency and High-Participatory Planning and Governance



Industrial Zone, Tibungco Proper, Davao City





INTER-AGENCY
 DEVELOPMENT
 INTERVENTIONS FOR
 SUSTAINABILITY
 AND WELL-BEING

IDIS Proposed Climate Mitigation & Adaptation Measures for Davao City LCCAP

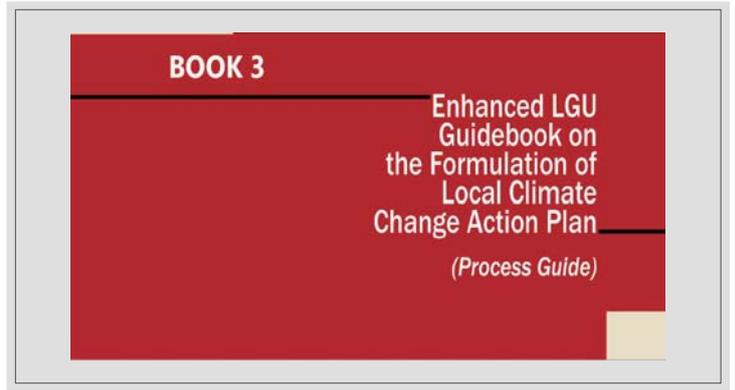
EnP. Lemuel Lloyd I. Manalo
 Environmental Research Specialist, IDIS

Recommendations for Policy (New Green Ordinances)

1. Land-usage limitations for Wetlands and Floodplains preservation
2. Requirement of Green Roof, Balcony and Community Gardening systems for High-rise Buildings, Commercial-Office Buildings and etc.
3. Requirement of sustainable urban drainage systems for large establishments
4. Protection of urban street islands, plant-strips and vegetation enhancement
5. Green procurement and purchasing ordinance for Local Government Unit
6. Organic Agriculture Network Zones
7. Urban Tree Preservation, Mainstreaming Earth Balling and Replacing Techniques
8. Strengthening of Community-Based Monitoring and Enforcement (Park Watchers, Bantay Suba, Bantay Bukid and Bantay Dagat)



Dona Vicenta, Marfori, Davao City



Climate Change Act

 <p>AO 171</p> <p>Created the Presidential Task Force on Climate Change (PTFCC)</p>	 <p>EO 774</p> <p>Reorganization of PTFCC designating the President as Chairperson</p>	 <p>RA 9729</p> <p>Climate Change Act of 2009</p>	 <p>RA 10174</p> <p>Establishes the People's Survival Fund</p>
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Mandate under the Climate Change Act

SEC . 14. Local Climate Change Action Plan. –

- The LGUs shall be the frontline agencies in the formulation, planning and implementation of climate change action plans
- Barangays shall be directly involved with municipal and city governments in prioritizing climate change issues and in identifying and implementing best practices and other solutions.
- Municipal and city governments shall consider climate change adaptation, as one of their regular functions.
- LGUs shall regularly update their respective action plans to reflect changing social, economic, and environmental conditions and emerging issues.
- It shall be the responsibility of the national government to extend technical and financial assistance to LGUs for the accomplishment of their Local Climate Change Action Plans.
- The LGU is hereby expressly authorized to appropriate and use the amount from its Internal Revenue Allotment necessary to implement said local plan effectively, any provision in the Local Government Code to the contrary notwithstanding.

WHAT IS LOCAL CLIMATE CHANGE PLAN?

- LCCAP is the action plan formulated by the LGUs to address climate change concerns.
- The LCCAP focus on both climate adaptation and mitigation and describes how LGUs plan to respond to climate change and mainstream such into local development plans.

PEOPLE'S SURVIVAL FUND

SEC. 18. Creation of the People's Survival Fund. –
 A People's Survival Fund (PSF) is hereby established as a special fund in the National Treasury for the **financing of adaptation programs and projects** based on the National Strategic Framework.

PEOPLE'S SURVIVAL FUND

- annual fund intended for local government units and accredited local/community organizations to implement climate change adaptation projects that will better equip vulnerable communities to deal with the impacts of climate change.
- Local government units with high poverty incidence, are exposed to climate risks, and has a key biodiversity area will be prioritized.
- intended for adaptation activities that include water resources management, land management, agriculture and fisheries, health, among others, and serve as guarantee for risk insurance needs for farmers, agricultural workers and other stakeholders.

CRITERIA FOR LGUs SEEKING TO ACCESS THE FUND

- **POVERTY INCIDENCE (40%)** – This criterion identifies the proportion of families (or population) with per capita income less than the per capita poverty threshold to the total number of families (population).
- **EXPOSURE TO CLIMATE RISK (30%)** – This criterion pertains to the potential climate change risks of the province in relation to projected mean temperature rainfall change, and extreme weather events.
- **PRESENCE OF IDENTIFIED AND DELINEATED KEY BIODIVERSITY AREAS (30%)** – Biodiversity areas are sites that are critical for the conservation of globally important biodiversity, identified through the criteria which are:
 - Globally threatened species;
 - Restricted-range species; and
 - Congregatory species.



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-  interfacedvo@gmail.com

“A Review and Analysis on Davao City’s Climate Change Vulnerability and Risk Assessment”

Dr. Gernelyn T. Logrosa
Malayan Colleges Mindanao

Davao City in context

Davao City is located in the southeastern part of Mindanao. A substantial part of Davao City is mountainous, characterized by extensive mountain ranges with uneven distribution of plateaus and lowlands

The Davao River, with its numerous tributaries, is the main drainage system of the City.



Why we need to know Davao City’s Climate Change Vulnerability and Risk?

Although Climate Change has a global focus, there is no *one-size-fits-all* approach to this problem. Every country has different economic development needs and capacities. Every city has a unique set of resources that reflect its own socio-economic conditions.

Therefore, vulnerability and risk relating to Climate Change should be understood from a local context. From this contextualized understanding, then we can produce tailored fit mitigative and adaptive strategies.



United Nations, 2012

Risk of Climate Change in Davao City

Davao City falls under the Type IV climate of the Coronas Climate Classification System of the Philippine Atmospheric, Geophysical and Astronomical Sciences Administration (PAGASA). This means rainfall is almost evenly distributed during the whole year.

Table 1: Seasonal Temperature Change in 2020 and 2050 under A1B Medium-Range Emission Scenario for Davao City

SEASON	OBSERVED (°C)	PROJECTED CHANGE (°C)		PROJECTED MEAN TEMPERATURE (°C)	
	(1971-2000)	(2006-2035)	(2036-2065)	(2006-2035)	(2036-2065)
Dec-Jan-Feb (DJF)	26.9	0.9	1.9	27.8	28.8
Mar-Apr-May (MAM)	27.8	1.1	2.2	28.9	30.0
Jun-Jul-Aug (JJA)	28.9	1.1	2.3	28.0	29.2
Sep-Oct-Nov (SON)	27.1	1.0	2.0	28.1	29.1

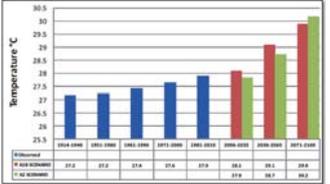


Figure 1: Annual Average Temperature of Davao City, 1914-2100

Data Source: PAGASA, Region XI

Why we need to know Davao City’s Climate Change Vulnerability and Risk?

Davao is rapidly developing.




Risk of Climate Change in Davao City

UN International Strategy for Disaster Reduction (ISDR) Policy Issues and Guidelines, water-related disasters account for 90% of all natural disasters, and their frequency and intensity generally rise. In Davao City, the average monthly rainfall increased by 10mm from 1990 to 150mm as recorded in 2010.

Table 2: Seasonal Rainfall Change in 2020 and 2050 under Medium-Range Emission Scenario for Davao City

SEASON	OBSERVED (mm)	PROJECTED CHANGE (%)		PROJECTED RAINFALL AMOUNT (mm)	
	(1971-2000)	(2006-2035)	(2036-2065)	(2006-2035)	(2036-2065)
Dec-Jan-Feb (DJF)	288.1	18.1	15.2	340.25	331.9
Mar-Apr-May (MAM)	347.1	-9.8	-12	313.08	305.4
Jun-Jul-Aug (JJA)	494.1	-7.8	-12.6	455.56	431.8
Sep-Oct-Nov (SON)	442.3	-2.4	-4.5	431.68	422.4



Data Source: PAGASA, Region XI; Photo from Edge Davao

Five (5) Main Natural Hazards in Davao City

Flood
Landslide
Storm Surge
Liquefaction
Active Fault Line

Data Source: OCPDC;
 Photo from Edge Davao;
 Newsline

Five (5) Main Natural Hazards in Davao City: Population Vulnerability Index

Flood
Landslide
Storm Surge
Liquefaction

Data Source: OCPDC

Five (5) Main Natural Hazards in Davao City: Susceptibility Maps

Flood
Landslide
Storm Surge
Liquefaction

Data Source: OCPDC

Main Natural Hazards in Davao City: Natural Resource Based Production Areas

Landslide
Flood
Storm Surge

Data Source: OCPDC

Vulnerability and Risk Assessment

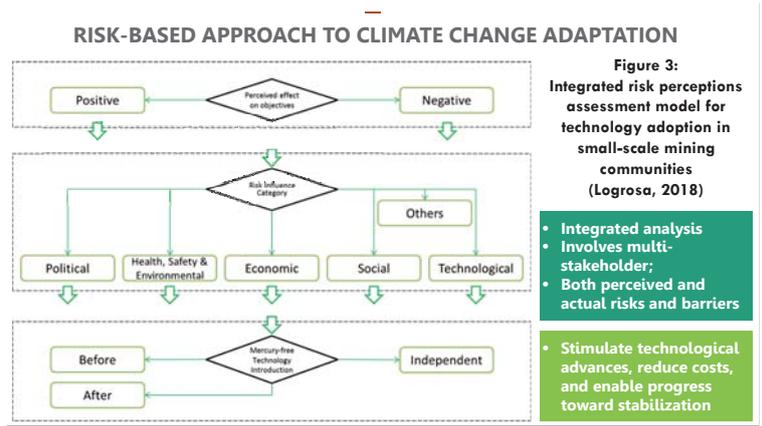
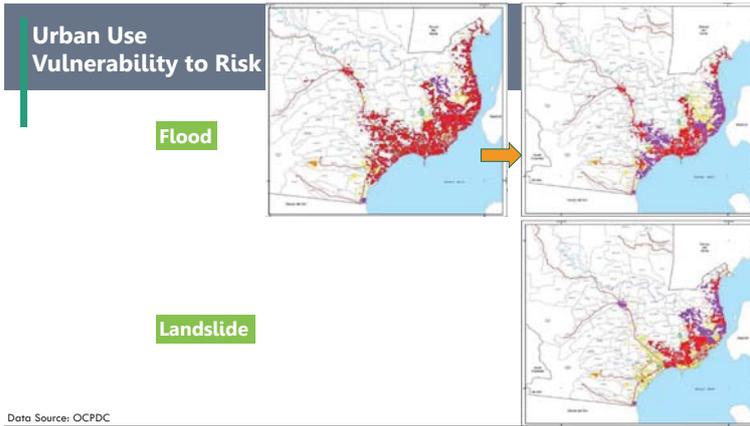
POPULATION
NATURAL RESOURCE-BASED PRODUCTION AREAS
CRITICAL POINT FACILITIES
URBAN USE AREAS
LIFELINE UTILITIES

Data Source: OCPDC

Natural Resource Based Production Areas: Vulnerability to Risk

Flood
Landslide

Data Source: OCPDC



CLIMATE CHANGE AND SUSTAINABILITY DEVELOPMENT

The most promising policy approaches, therefore, seem to be those that capitalize on natural synergies between climate protection and development priorities to advance both simultaneously (IPCC, 2007).

Emerging research has identified methodological approaches to identify, characterize and analyze the interactions between sustainable development and climate change responses. Several authors have suggested that sustainable development can be addressed as a framework for jointly assessing social, human, environmental and economic dimensions (IPCC, 2007).

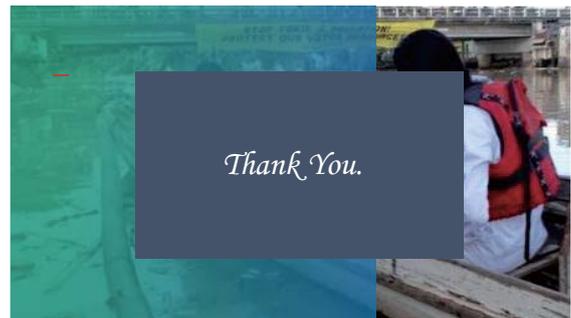
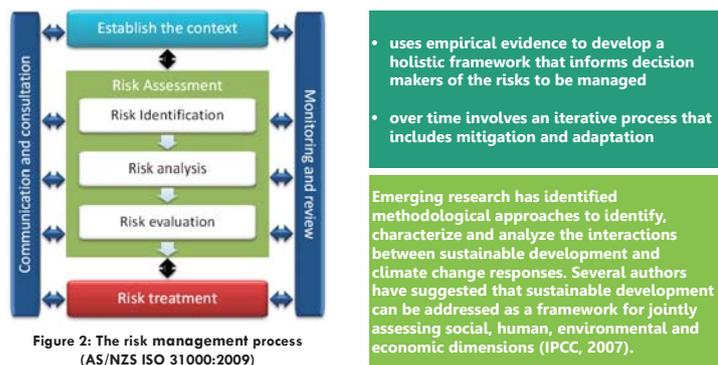


RECOMMENDATIONS



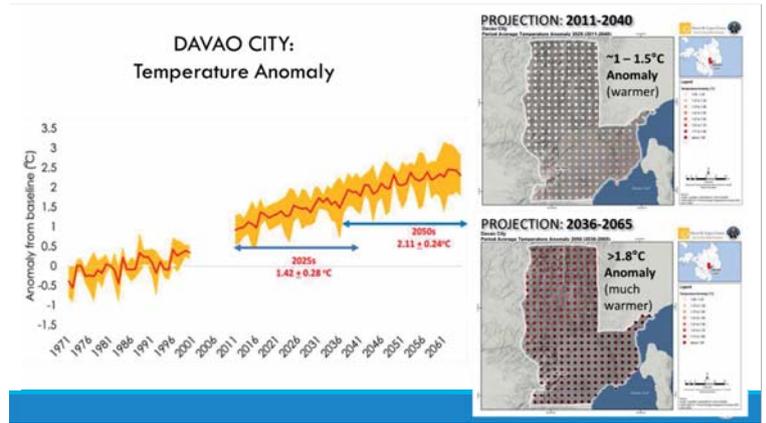
- 3 I's**
1. Integrated risk model
 2. Iterative management to inform decision-making
 3. Inclusive multi-stakeholder approach

RISK-BASED APPROACH TO CLIMATE CHANGE ADAPTATION



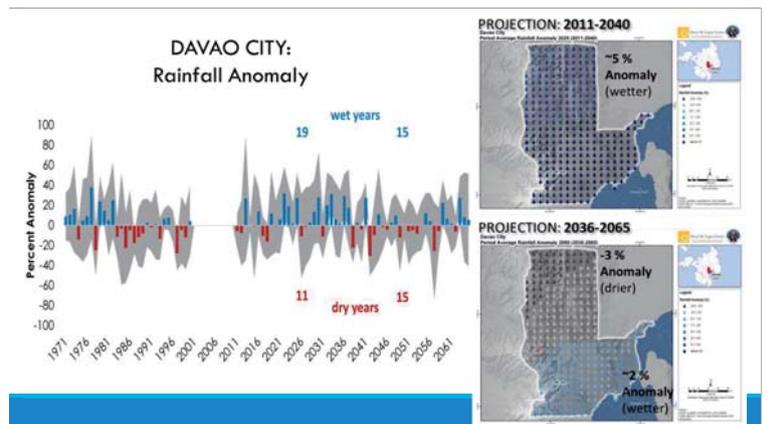
GHG Inventory of Davao City

Dr. Doris B. Montecastro
Ateneo de Davao University
30 January 2020, Malayan Colleges of Mindanao



Climate Change Projections in Mindanao

MANILA OBSERVATORY W/ OSCAR M. LOPEZ (OML) FOUNDATION (DAVAO), CHRISTIAN AID (ZAMBOANGA), AND USAID PROJECTS (CDO)



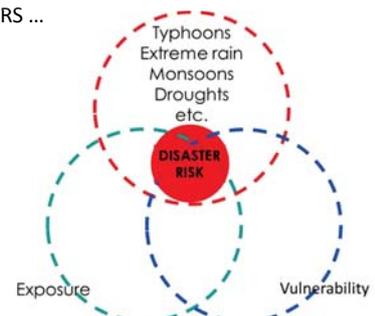
CITY	YEAR	TEMP. (°C)	PRECIP. (%)
Davao City	2025	1.4	~3%
	2050	2.1	+5% to -3%
Davao Oriental	2025	1.3	~1 to 7%
	2050	1.9	+1% to -1.8%
CDO	2025	0.9	1% to 4%
	2050	1.5	-2% to -5%
Zamboanga City	2025	1.4	+0.2% to -0.6%
	2050	2.2	-0.2% to -0.6%

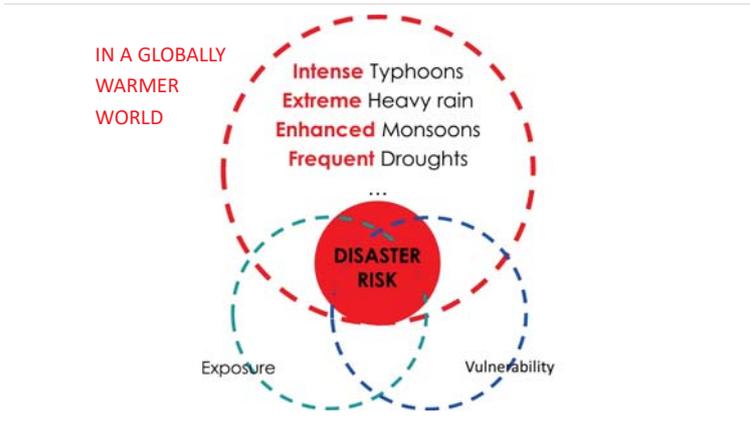
} 2025: wetter
} 2050: drier

} drier

Summary

AT RISK TO DISASTERS ...





Area	Data Source Identifier (e.g. Residential Survey Number)	Type of Data (e.g. Individual Household Survey, National Census Averages, Other) - please select from drop-down	Appliances (e.g. cooking, lighting, generators) - please select from drop-down	Fuel Type - please select from drop-down	Annual Total Consumption	Units (e.g. kWh, kg, tonnes, m ³) - insert only	Data Source section in 'C' Management
Davao City	PRA	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Wood or Wood Waste (Biomass, International)	218,948,525	kg	
Davao City	PRA	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Kerosene (International)	3,074,300	l	
Davao City	PRA	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Propane or Liquefied Petroleum Gases (International)	5,589,079.00	kg	
Davao City	PRA	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Charcoal (Biomass, International)	32,081,690.00	kg	

LOCAL CLIMATE CHANGE ACTION PLAN (LCCAP)

- R.A. 9729, SEC. 14 - "The LGUs shall be the frontline agencies in the formulation, planning and implementation of climate change action plans in their respective areas..."

Adaptation

".. adjustments in natural or human systems to a new or changing environment."

Mitigation

"..policy or action, measures or strategies to reduce or avoid GHG emissions or to increase GHG absorption."

Reference: DILG. (2014). LGU Guidebook on the Formulation of Local Climate Change Action Plan (LCCAP) Book 2

EMISSION SOURCES

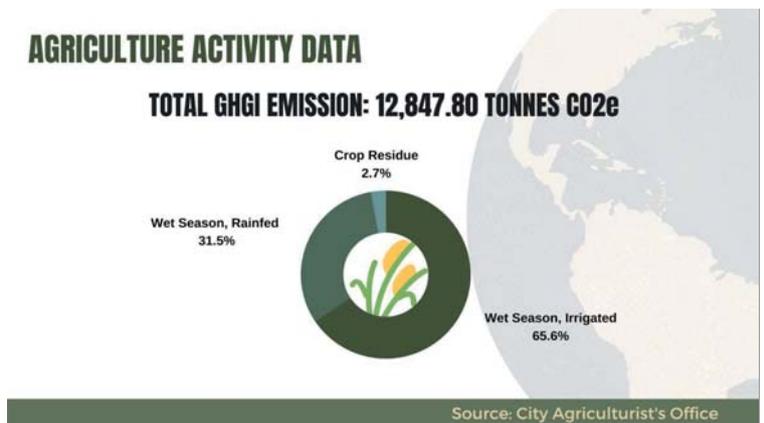
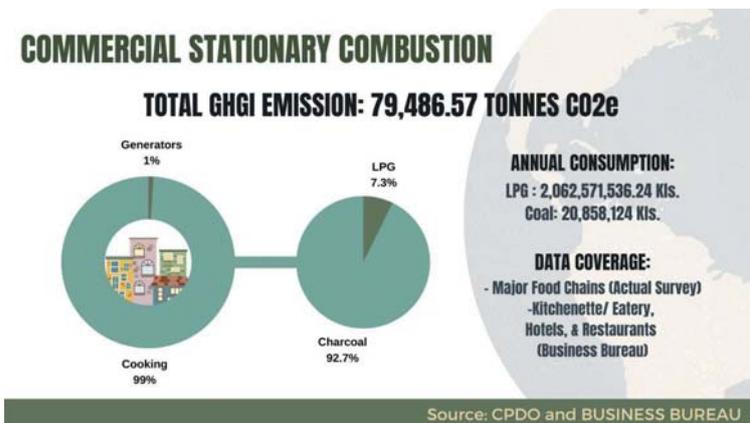
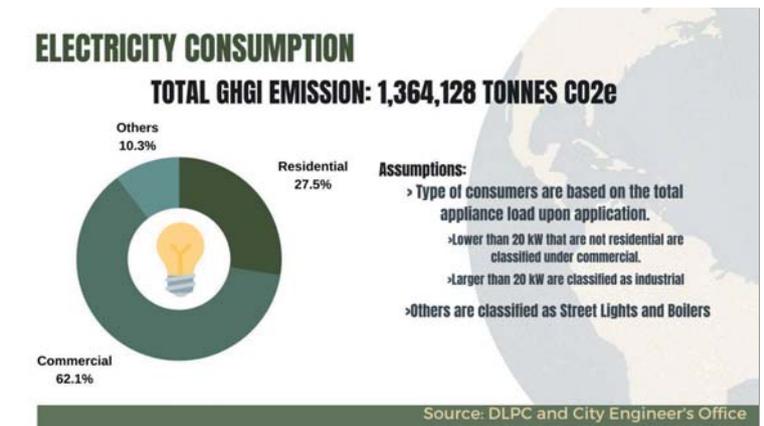
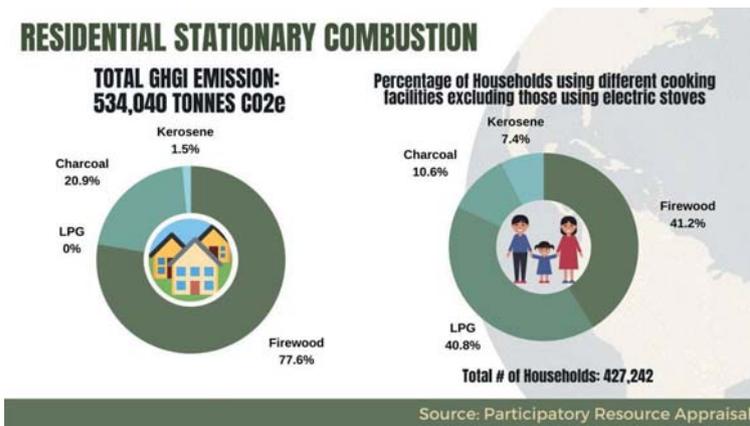
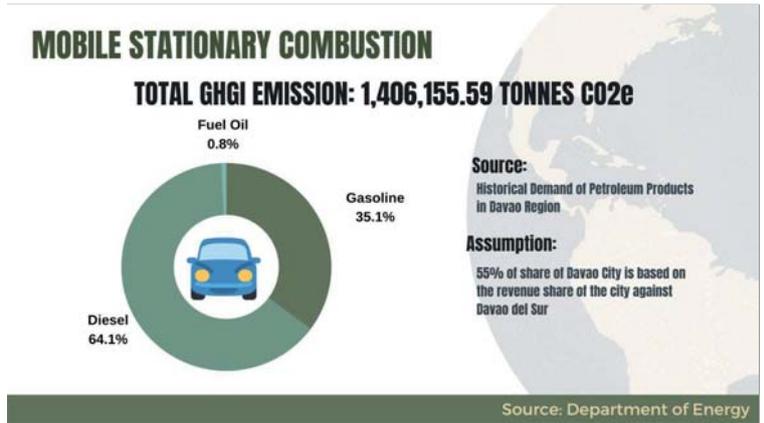
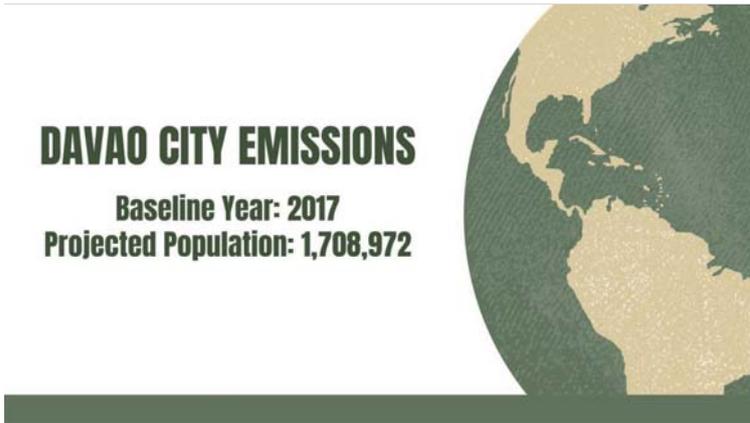
Area Sources	Industrial Sources	Mobile Sources
Commercial Cooking	coal	Jeepney
Generator Sets	bunker	Motorcycle
Landfill	Low Sulphur fuel oil	Tricycle
Residential Cooking	wood	Taxi
Residential Lighting	power plant	Utility Vehicles (UV)
Agricultural Lands	cement	Sports Utility Vehicles (SUV)
		Car
		Light Duty Vehicles (LDV)
		Truck
		Trailer

GHG Inventory

- Estimates of all emissions and removals of greenhouse gases (GHG) from given sources or sinks from a defined region in a specific period of time (IPCC, 2015).
- Help identify the major source of air pollution so that mitigation measures can be made

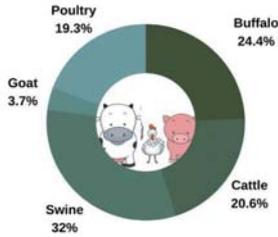
Reference: US EPA. (2016). Climate and Energy Resources for State, Local and Tribal Governments

UPDATES ON DAVAO CITY GREENHOUSE GAS INVENTORY



AGRICULTURE ACTIVITY DATA (LIVESTOCK)

TOTAL GHGI EMISSION: 305,171.49 TONNES CO2e



TOTAL HEADCOUNT:

Buffalo- 38,642
Cattle- 36,318
Swine- 229,854
Goat- 46,867
Poultry- 6,905,140

Source: City Veterinarian's Office

INDUSTRIAL PROCESS

TOTAL GHGI EMISSION: 2,860,448 TONNES CO2e

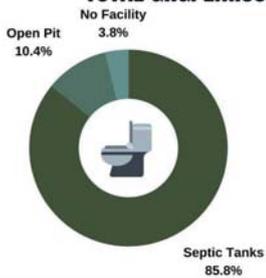


**Total Annual Production:
1,430,224 Tons**

Source: HOLLIM Philippines

WASTEWATER TREATMENT AND DISCHARGE

TOTAL GHGI EMISSION: 186,067.53 TONNES CO2e



Limitation:
Data used only covers the residential wastewater

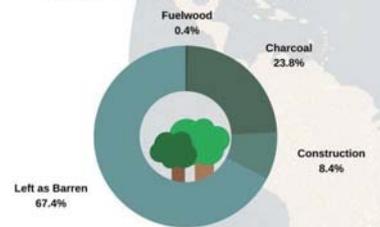
Source: City Healthy Office

FORESTRY AND LAND USE

TOTAL GHGI EMISSION: 175,203.45 TONNES CO2e

99% of the emission are from the changes in the use of the forestlands for agriculture. The remaining 1% are from wood and wood products harvesting.

Wood and Wood Products Harvesting



Source: CPDO FLUP

SOLID WASTE DISPOSAL

TOTAL GHGI EMISSION: 25.2 TONNES CO2e



Total Solid Waste Collected:
Collection Area: 306,910.8 Tons
Non-Collection Area: 51,792.1 Tons

*Based on CENRO Waste Analysis Characterization Study

Source: City Environment and Natural Resources Office

**6,491,909 Tonnes CO2e
Total Emissions**

TOP 5 SOURCES OF EMISSIONS



INDUSTRIAL PROCESSES



MOBILE COMBUSTION



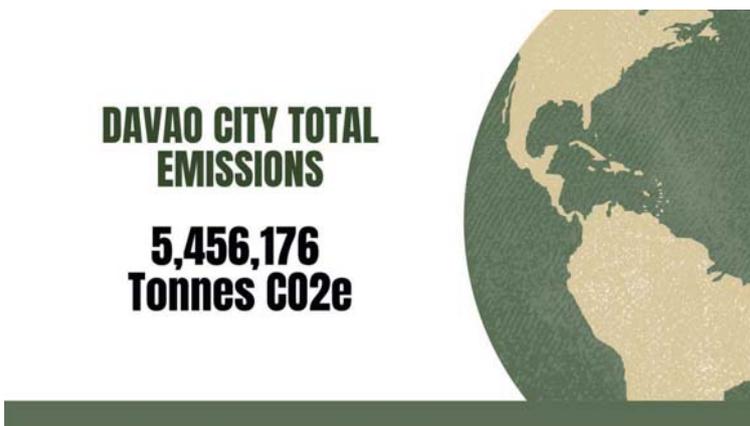
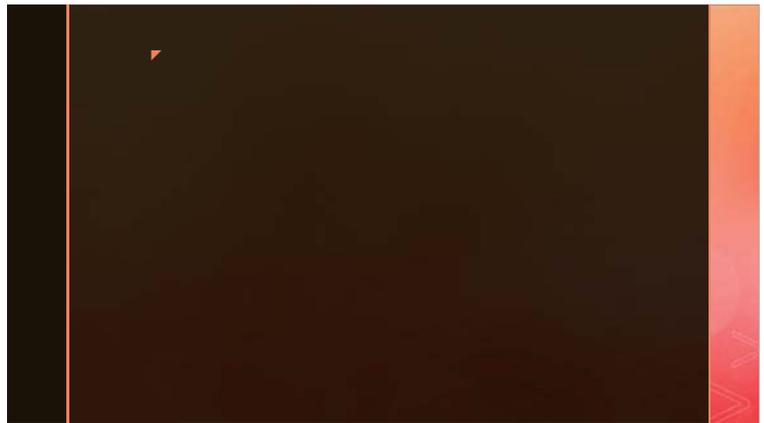
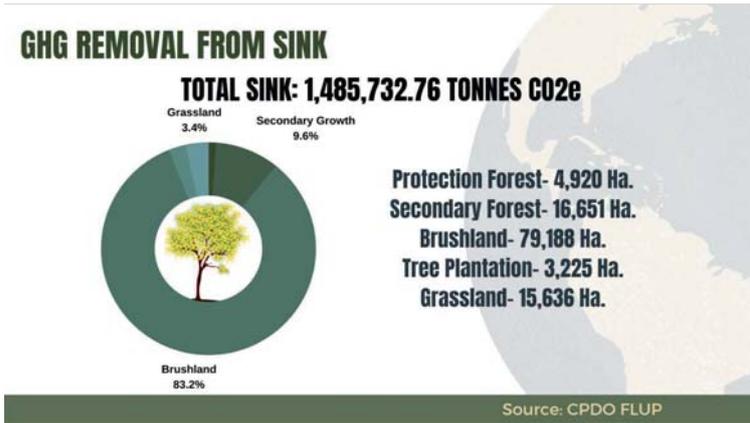
ELECTRICITY COMMERCIAL



RESIDENTIAL COMBUSTION



AGRICULTURE LIVESTOCK



SUMMARY OF ACTIVITY DATA (2016)

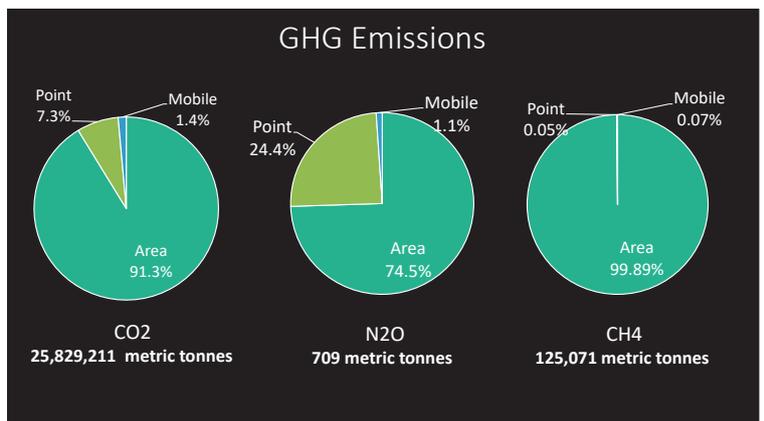
Area Sources	Value	Unit
From Landfill, Commercial & Residential Cooking	214,056	metric tons/year
Generator Sets (diesel)	17,724,574	liters/year
Agricultural Lands (CLUP)	91,082	hectares
Forest Cover (CLUP)	134,380	hectares

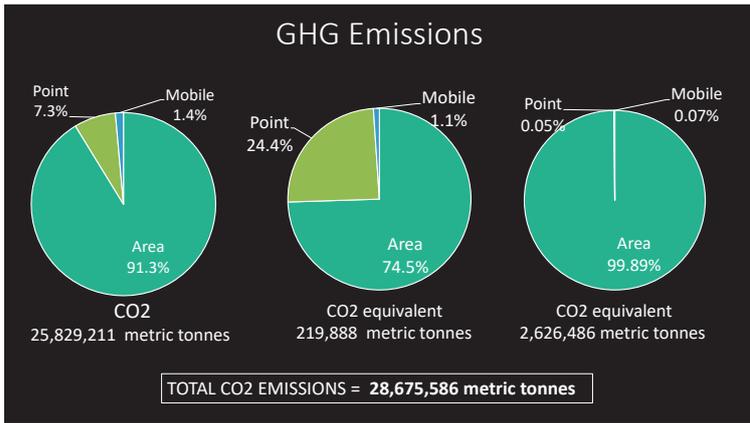
Industrial Sources	Value	Unit
Coal & Wood	1,117,011	metric tons/year
LSFO & Bunker	17,247,459	liters/year

Mobile Sources	Value	Unit
Vehicle Kilometers Travelled (VKT)	2,859,368,067	kilometers
Total Idling Time	57,762,702	hours

IMPLICATIONS

- Mitigation measures need to address sources
- Updating of GHG Inventory?
- Short-lived Climate Pollutants (SLCPs) – O3, PM, CFCs, HFCs
- SDGs (Sustainable Development Goals)





SUMMARY OF ACTIVITY DATA (2017, CPDO)

Area Sources	Value	Unit
From Landfill, Commercial & Residential Cooking	214,056	metric tons/year
Generator Sets	293,518	liters/year
Agricultural Lands	91,082	hectares
Forest Cover	116,620	hectares

Point Sources	Value	Unit
Coal & Wood	1,117,011	metric tons/year
LSFO & Bunker	17,247,459	liters/year

Mobile Sources	Value	Unit
Vehicle Kilometers Travelled (VKT)	2,859,368,067	kilometers
Total Idling Time	57,762,702	hours

Greenhouse Gas Inventory of Davao City

Documentation of Methodologies

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Cooperation with IGES, Kitakyushu City government &
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I. Executive Summary

This report documents Davao City's greenhouse gas (GHG) inventory, a detailed accounting of GHG releases based on 2017 baseline data.

Davao City is a first-class city in the island of **Mindanao, Philippines**. It is considered as the largest city in the Philippines with a total land area of 2,443.61 km² (943.48 sq mi). It is the most populous city in Mindanao with a population of 1,632,991 with a growth rate of 2.30%, based on the Philippine Statistics Census in 2015. The city is divided into three congressional districts, which are subdivided into 11 administrative districts with a total of 182 **barangays**.

The city has a projected average annual growth of 2.53 percent over 15 years. As the largest economy outside **Metro Manila**, the city also serves as the largest local economy in the southern Philippines. Agriculture remains the largest economic sector.

However, climate change impacts undermine the the sustainability and economic development of Davao City at present and in the longer term period. "Climate change is one of the biggest challenges of our time, especially for developing nations with limited capacity to address its multiple implications on a country's economic development. The Philippines is among the ten most vulnerable countries to the impacts of climate change, according to the United Nations Office for Disaster Risk Reduction (UNISDR). Located in one of the world's most typhoon-prone areas, the Philippines is visited by 20 typhoons annually and Filipinos have developed a familiarity to weathering heavy rains and floods during the rainy season."¹

The Philippines signed the Paris Agreement in 2017 which aims to "holding the increase of global temperature to "well below 2 degrees C above pre-industrial levels... and to pursue efforts to limit the temperature increase to 1.5 degrees C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change." This warming limit is key to prevent the irreversible damages caused by climate change. Philippines also submitted its Intended Nationally Determined Contributions (INDCs) outlining its target to cut emissions by 70 percent by 2030. The INDCs, now called Nationally Determined Contributions (NDCs) spells out the country's strategy for adaptation and mitigation by pursuing low-carbon development and cutting emissions in energy, transport, forestry, agriculture, industry and waste sectors. The Philippine Climate Change Commission (CCC) highlights the important role of the local government units, as partners in achieving the country's goal to cut carbon emissions through a transparent GHG inventory and reporting mechanism.

Climate Change Act of 2012 (RA 10174) mandates the Philippine Government to address climate change in the context of sustainable development. A guideline for the formulation of the Local Climate Change Action Plan supports Local Government Units in identifying mitigation options to help reduce carbon footprints and contribute to efforts in addressing climate change.

In 2018, Davao City affirmed its commitment to GHG policy by creating a Technical Working Group

¹ <https://climate.gov.ph/files/GHG-Manual-for-Business-2017.pdf>

under the Executive Order No. 40 to facilitate in the preparation of the Local Climate Change Action Plan and GHG Inventory Report. It also forged a memorandum of agreement with the City of Kitakyushu, Japan for mutually beneficial cooperation for the development of two cities such as low carbon society and others.

The Climate Change Commission developed a manual on GHG Inventory to guide LGUs in accounting for their community-level GHG inventories. Although, the rules governing the conduct of GHG Inventories are voluntary and dependent on the choices made by the LGUs but are anchored in internationally recognized standards and protocols on community-level GHG accounting. The main reference document for the conduct of this type of inventory is the IPCC Guidelines for National GHG Inventories.

The GHG Inventory in Davao City covered scope 1 for most sources and scope 2 for purchased electricity. These are stationary combustion from commercial and residential buildings; mobile combustion; purchased electricity (i.e. commercial buildings, residential buildings, others i.e. streetlights); solid waste in landfills; wastewater treatment and discharge; agriculture (crops and livestock); forestry and land-use changes; and industrial processes and products use for selected industries.

A summary of Greenhouse Gas Emissions for Davao City based on 2017 accounting reported a total of GHG emissions output of 4,708,349 tonnes CO₂e for all sectors covered. Emissions from community mobile combustion (29.85%) and industrial processes and product use (60.75%) are the highest contributor to GHG emissions.

The total net GHG emissions accounted for about 31.56% tonnes of CO₂e released and removed from sink or sequestered by the remaining primary and secondary growth forestlands and brushlands in the city.

As Davao City accounts for its GHG emissions for the first time there were a few challenges encountered. Articulating these impediments will contribute to the improvement of the GHGI inventory in the next reporting period.

1. Filtering of data. Some figures such as the specific business line of establishments were not disaggregated according to the required values of the GHG inventory.
2. Difficulties in securing the total production values of commercial and industrial processes as most businesses would prefer not to divulge such information easily.
3. More capacity building for the GHGI team in learning the tools especially in the quantification process and identification of uncertainties per parameter and categories.
4. Partnership and linking with other Government Agencies. In the next reporting period, the quantification of GHG emissions in solid waste and wastewater treatment/discharge needs more preparation on the part of the Davao City TWG Team.

In all areas of concern, it is strategic for the team to collaborate, share information and learn from other agencies such as the Environmental Management Bureau, Barangay Local Government Units and all other national government agencies.

Table 1: Summary of Total Greenhouse Gas Emissions in Davao City in 2017, per sector

Emission Source	GHG Emissions (tonnes CO ₂ e)	The proportion of Total Emissions
Scope 1 Emissions (Net of Forestry and Land Use)		
GHG Emissions from Community-Level Residential Stationary Fuel Use	534040.77	11.34%
GHG Emissions from Community-Level Commercial Stationary Fuel Use	79486.57	1.69%
GHG Emissions from Community Mobile Combustion	1405481.84	29.85%
GHG Emissions from Solid Waste Disposal - IPCC FOD Method*	0.00	0.00%
GHG Emissions from Other Solid Waste Treatment (ICLEI)*	18285.15	0.39%
GHG Emissions from Solid Waste Open Burning (ICLEI)*	49.24	0.00%
GHG Emissions from Wastewater Treatment and Discharge	186067.53	3.95%
GHG Emissions from Community-Level Agriculture (Crops)	12847.80	0.27%
GHG Emissions from Community-Level Agriculture (Livestock)	305171.49	6.48%
GHG Emissions from Solid Waste Disposal - Inside LGU Geopolitical Boundaries (ICLEI)	0.00	0.00%
GHG Emissions from Wastewater Treatment and Discharge (Other Sources)	0.00	0.00%
GHG Emissions from Industrial Processes and Product Use	2860448.00	60.75%
Scope 1 Emissions/Removal (Forestry and Land Use)		
GHG Emissions from Forestry and Land Use	175203.45	3.72%
GHG Removal from Sink	-1485732.76	-31.56%
Total Scope 1 Emissions	4,091,349	86.88%
Scope 2 Emissions		
GHG Emissions from Purchased Electricity at Community-Level Residential Sites	150257.18	3.19%
GHG Emissions from Purchased Electricity at Community-Level Commercial Sites	338965.79	7.20%
GHG Emissions from Purchased Electricity at Community-Level for All Other Sources	127776.50	2.71%
Total Scope 2 Emissions	616,999	13.10%
Scope 3 Emissions		
GHG Emissions from Solid Waste Disposal - Outside LGU Geopolitical Boundaries (ICLEI)	0.00	0.00%
Total Scope 3 Emissions		
	4,708,349	99.98%

II. Background Information

Socio-economic Situation of Davao City

Davao City is a first-class city in the island of [Mindanao, Philippines](#). It is considered as the largest city in the Philippines with a total land area of 2,443.61 km² (943.48 sq mi). It is the most populous city in Mindanao with a population of 1,632,991 with a population growth rate of 2.30%.² Population density is seven (7) persons per hectare. Population projection for 2023 indicated that the population will reach to 1,971,499.³

The city is divided into three congressional districts, which are subdivided into 11 administrative districts with a total of 182 [barangays](#).

Table 2: Quick Facts About Davao City

Total population (2015)	1,632,991
Land area (hectares)	244,000
Population Density (per hectare)	7 persons
Population Growth Rate	2.30%
Number of barangays/villages	182
IRA share	3,330,085,561
IRA dependency rate	53.97%
Total LGU income	7,307,595,301.66
Average LGU revenue per capita	4,474.97
Ecosystem type	Watershed
Economy	First-class

Source: *Davao City Socio-economic Indicators*

Geography

Davao City is approximately 588 miles (946 km) southeast of Manila over land and 971 kilometers (524 NMI) by sea. The city is located in southeastern Mindanao, on the northwestern shore of [Davao Gulf](#), opposite [Samal Island](#).⁴

² PSA 2015

³ ibid

⁴ Wikipedia, Davao City

Davao City is located in the southeastern part of Mindanao, lying in the grid squares of 6 58' to 7 34' N latitude, and 125 14' to 125 40' E longitude. It is bounded on the north by **Davao** Province; on the east partly by **Davao** Province and **Davao** Gulf; on the south by **Davao del Sur**, and the west by North Cotabato.⁵

Davao City is divided into three (3) congressional districts which are further subdivided into 182 barangays. It has 11 administrative districts situated in the three congressional districts (See Fig. 1-Map)



Source: Office of the City Planning and Development Coordinator

Figure 1: Administrative Map of Davao City by district

Topography

Davao City's land, totaling about 2,443.61 square kilometers (943.48 sq mi), is hilly in the west (the Marilog district) and slopes down to the southeastern shore. **Mount Apo**, the highest peak in the Philippines, is located at the city's southwestern tip. The **Davao River** is the city's primary drainage channel. Draining an area of over 1,700 km² (660 sq mi), the 160-kilometer (99 mi) river begins in the town of **San Fernando, Bukidnon**. The mouth of the river is located at Barangay Bucana at Talomo District.⁶

5 Davao City Comprehensive and Land Use Plan 2019

6 CLUP 2018-2022, Ecological Profile of Davao City

Climate

Davao has a [tropical rainforest climate](#) (Köppen climate classification Af), with little seasonal variation in temperature. The areological mechanism of the [Intertropical Convergence Zone](#) occurs more often than that of the [trade winds](#) and because it experiences rare cyclones the climate is not purely equatorial but subequatorial. Average monthly temperatures are always above 26 °C (78.8 °F), and average monthly rainfall is above 77 millimeters (3.03 in). This gives the city a tropical climate, without a true [dry season](#); while there is significant rainfall in winter, the largest rainfall occurs during the summer months.⁷

However, climate projections of PAGASA reveal that the city will experience an increase in the average temperature between 0.9 to 1.1 degrees Celsius by 2020 and up to 2.3-degree celsius in 2050. According to the report of the Intergovernmental Panel on Climate Change (IPCC), the effects of a 1-degree Celsius increase in temperature may invade decreased availability of water, reduced farmer's productivity, lower cereal productivity in low altitudes, droughts, malnutrition, and increase morbidity rate. Other effects include storms, floods, increased coral bleaching, increase risk of wildfire, and increase risk of extinction of more than 30% of species in the world.⁸

Economy

The city serves as the main trade, commerce, and industry hub of Mindanao, and the regional center of [Davao Region](#).

Davao is part of the [East Asian Growth Area](#), a regional economic-cooperation initiative in [Southeast Asia](#).

The city has a projected average annual growth of 2.53 percent over 15 years. As the largest economy outside [Metro Manila](#), the city also serves as the largest local economy in the southern Philippines.

Commerce, Trade, and Industry⁹

Agriculture remains the largest economic sector comprising banana, [pineapple](#), [coffee](#) and coconut plantations in the city. It is the island's leading exporter of fruits such as [mangoes](#), [pomelos](#), bananas, coconut products, pineapples, [papayas](#), [mangosteens](#), and [cacao](#).

In 2016, production areas for agricultural and industrial crops, fruits, root crops, and vegetables spanned approximately 74,158 hectares with a total production of 630,000 metric tons.

The volume of livestock production for cattle and carabao were estimated to be at 74,570 heads in 2016. The swine production is in part 53.78% (222,341 heads) of the total livestock production with goats totaling 11.26% (46,553 heads) and poultry at 6, 293,775 heads.

Aquaculture production in Davao City reached 617,020 metric tons in 2016, accounted as: inland fishing at 908.79 metric tons; fishponds at 227,418.92 metric tons; and deep-sea fishing at 388,597.95

7 Wikipedia, https://en.wikipedia.org/wiki/Davao_City

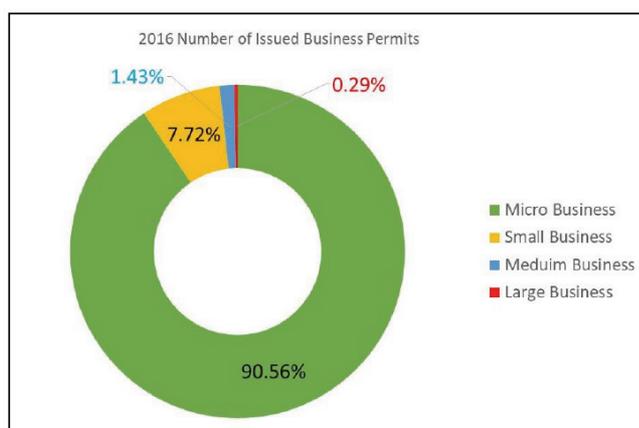
8 Davao City Comprehensive Land Use Plan 2019

9 Davao City Comprehensive Land Use Plan 2019

metric tons.

The chocolate industry is the newest development in the city. Malagos Chocolate, developed by Malagos Agriventures Corp., is now the country's leading artisan chocolate recognized worldwide. On the other hand, Seed Core Enterprises is the country's biggest exporter of cacao to Barry Callebaut. Local corporations like Lorenzo Group, Anflo Group, AMS Group, Sarangani Agricultural Corp. and Vizcaya Plantations Inc. have operations and headquarters in Davao City. Multinational companies like Dole, Sumifru/Sumitomo, and Del Monte have their regional headquarters in the city.¹⁰

In 2016, the city registered 36,254 establishments with capitalisation of Php 227,395,300,819.52. The majority of the investment (77.83%) are large from large businesses. While micro businesses hired the most number of employees at 122, 389 (64.77%).¹¹



Source: Business Bureau

Figure 2: 2016 Number of Issued Business Permits

A total of 60,759 business lines were registered in 2016. Each business establishment may have more business lines. Retailers account for 42.11% of the business lines, services at 18%, wholesalers/distributors at 9.66%, and food handlers composed of restaurants, cafeterias, and refreshment parlors at 6.5%. Moreover, a particular increase in delivery services has been reported at 5.31%.¹²

Table 3. Business Establishments, Capitalization and Employment, by Type of Business, 2015

Type of Business	Issued Permits	Capitalization	No. of Employees
Micro	31,126	14,117,541,772.46	114,196
Small	2,483	16,855,256,666.60	40,488
Medium	482	15,229,207,136.16	18,516
Large	101	167,688,409,516.34	6,703
Davao City	34,192	213,890,415,091.56	179,903

Source: Business Bureau – City Mayor’s Office, Davao City

10 Wikipedia, https://en.wikipedia.org/wiki/Davao_City

11 Davao City Business Bureau

12 CPDO, Davao City Socio-economic indicators

III. National and Local Policies for GHGI

In March 2017, the Philippines signed the Paris Climate Agreement. It is a landmark agreement signed by 195 nations during the 21st Conference of Parties (COP 21) in December 2015 with the aim to “holding the increase of global temperature to “well below 2 degrees C above pre-industrial levels... and to pursue efforts to limit the temperature increase to 1.5 degrees C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.” This warming limit is key to prevent the irreversible damages caused by climate change.¹³

The Philippines submitted its Intended Nationally Determined Contributions (INDCs) outlining its target to cut emissions by 70 percent by 2030. The INDCs, now called Nationally Determined Contributions (NDCs) spells out the country’s strategy for adaptation and mitigation by pursuing low-carbon development and cutting emissions in energy, transport, forestry, agriculture, industry and waste sectors. Key to achieving this goal is limiting the emission of carbon dioxide and the six greenhouse gases (GHG), which are released by burning fossil fuels and these gases trap heat in the Earth’s atmosphere. The Philippine Climate Change Commission (CCC) highlights the important role of the local government units, as partners in achieving the country’s goal to cut carbon emissions through a transparent GHG inventory and reporting mechanism.¹⁴

As stated under the Climate Change Act of 2012 (RA 10174), the Philippine Government is mandated to strengthen, integrate, consolidate, and institutionalize government initiatives to achieve coordination in the implementation of plans and programs to address climate change in the context of sustainable development.

Section 14 of RA 10174 identifies concrete areas for collaboration:

- LGUs shall be the frontline agencies in the formulation, planning, and implementation of climate change action plans.
- Barangay shall be directly involved with municipal and city governments in prioritizing climate change issues and in identifying and implementing best practices and other solutions.
- Municipal and city governments shall consider climate change adaptation, as one of their regular functions.
- LGUs shall regularly update their respective action plans to reflect changing social, economic and environmental conditions and emerging issues.

The law further annotates on specific roles and support for implementation:

- It shall be the responsibility of the national government to extend financial and technical assistance to LGUs for the accomplishment of their Local Climate Change Action Plans.

13 Climate Change 2017. Philippine GHG Inventory and Reporting Protocol: Commission. Downloaded at <https://climate.gov.ph/files/GHG-Manual-for-Business-2017.pdf>

14 Ibid

- The LGU is hereby expressly authorized to appropriate and use the amount from its Internal Revenue Allotment necessary to implement said local plan effectively, any provision in the Local Government Code to the contrary notwithstanding.

Memorandum Circular NO. 2014-135 is a Guideline for the Formulation of the LCCAP as set forth by the Department of Interior and Local Government. The memo lays down the steps for LGUs to identify mitigation options to help reduce carbon footprints and contribute to efforts in addressing climate change.

The development of a greenhouse gas inventory supports better planning for mitigation options by the LGUs. To build the capacity of the LGUs in undertaking GHGI, the Climate Change Commission supports GHGI efforts of the LGUs through coordination, monitoring and evaluating programs; and overall action plans of the government relating to climate change.

A User's Manual on GHGI has been published and provides step-by-step guidance to the LGUs to quantify and manage information data related to the development of their community-level GHG inventories. The User's Manual also comes with a GHG Inventory Quantification Support Spreadsheet. Collectively, the spreadsheet and the manual provide concrete support to facilitate and institutionalize the process of planning, collecting and managing data, quantifying and reporting of an LGUs community-wide GHG emissions.

The scope of the GHG inventory, which Davao City is also using includes the following categories of emission sources:

1. Stationary Combustion from commercial and residential buildings
2. Mobile Combustion
3. Purchased electricity (commercial buildings, residential buildings, others i.e. streetlights)
4. Solid Waste in Landfills
5. Wastewater Treatment and Discharge
6. Agriculture (crops and livestock)
7. Forestry
8. Industrial Processes and Products Use for Selected industries

IV. Institutional Arrangements for GHGI

Davao City's GHG Inventory went through the process of planning and design, implementation, checking and reporting.

1. Local Chief Executive's commitment to GHG policy
 - May 15, 2018, kick-off meeting for the preparation of the Davao City Local Climate Change Action Plan (LCCAP)
 - November 28, 2017, MOU signed between the City of Kitakyushu, Japan, and Davao City LGU, establishing Green Sister City Cooperation which promote and expand effective, mutually beneficial cooperation for the development of the two cities such as low carbon society, resource recycling, capacity building for the officials of each city and other fields of cooperation as mutually agreed upon by the both parties.
2. Formation of the GHG management team
 - Executive Order No. 40 series of 2018 created a Technical Working Group (TWG) to facilitate in the preparation of the Local Climate Change Action Plan of Davao City, specifically on greenhouse gas inventory, and identification of mitigation and adaptation options.
3. Established GHG data collection, quality management, and assigned roles and functions
 - TWG Team headed by the City Planning Development Officer went through training preparations in GHGI quantification with the Climate Change Commission and Ateneo de Davao University. The team participated in a 3 day training workshop on GHG Inventory facilitated by the Climate Change Commission, in May 2019.
4. Actual GHGI data collection, calculating emissions, data quality management headed by the TWG, coordinated by the City Planning and Development Office
5. A 2-day preliminary LCCAP workshop was held on January 30-31, 2020 to present initial findings of GHGI and solicit greater stakeholder participation in the identification of community-specific mitigation and adaptation options.
6. Quality Management process to assess/check data collection, quantification and reporting process
7. Review of GHGI Inventory results by the members of the TWG and added improvements
8. Preliminary Greenhouse Gas Inventory Report, outlining lessons and challenges and initial mitigation options. The report and the learnings will be used as a benchmark in improving succeeding GHGI reporting.

V. Tools for GHGI Development

The 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 Guidelines) were developed at the invitation of the United Nations Framework Convention on Climate Change (UNFCCC) to update the Revised 1996 Guidelines and associated good practice guidance which provide internationally agreed methodologies intended for use by countries to estimate greenhouse gas inventories to report to the UNFCCC. The IPCC 2006 Guidelines provide an introduction to the 2006 Guidelines for a broad range of users, including countries and inventory compilers setting out to prepare inventory estimates for the first time.¹⁵

The Memorandum Circular No. 2014-135 or the Guidelines for the Formulation of the LCCAP, provides support to LGUs in reducing its GHG emissions. The rules governing the conduct of GHG Inventories are voluntary and dependent on the choices made by the LGUs but are anchored in internationally recognized standards and protocols on community-level GHG accounting. The main reference document for the conduct of this type of inventory is the IPCC Guidelines for National GHG Inventories. In some cases, the Global Protocol for Community-Scale GHG Emissions (GPC) is also used. The IPCC Guidelines and the GPC have provided good practice approaches in ensuring the quality of the GHG inventory report. The IPCC has identified the principles of relevance, completeness, consistency, transparency, accuracy, and measurability as indicators in the conduct of the inventory.

Davao City LGU made use of the IPCC 2006 quantification as a reference in computing for the standard GHG emissions and default values:

Activity data (A) is any data that pertains to the magnitude of human activity resulting to GHG emissions such as the volume of fuel (measured in Liters), weight of fuel (measured in kilogram units), amount of electricity usage (measured in kilowatt-hour) or distances traveled (measured in kilometers), etc.

Emission factor (EF) is the average emission rate of a given GHG for a given source, relative to units of activity — expressed as ratios, for example, 2.68 kg of CO₂ per Liter of diesel.

Activity data were secured from secondary and primary sources and published local or national databases. Emission Factor values were based on IPCC 2006 values and adapted as reference under the Philippine GHG Inventory User's Manual.

15 IPCC Guidelines 2006, <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol1.html>

VI. Greenhouse Gas Inventory Report¹⁶

The overall method of the Davao City’s Greenhouse Gas Inventory made reference to the steps and processes recommended by the Climate Change Commission in conducting GHGI and from the International Panel for Climate Change Guidelines for National GHGI 2006.

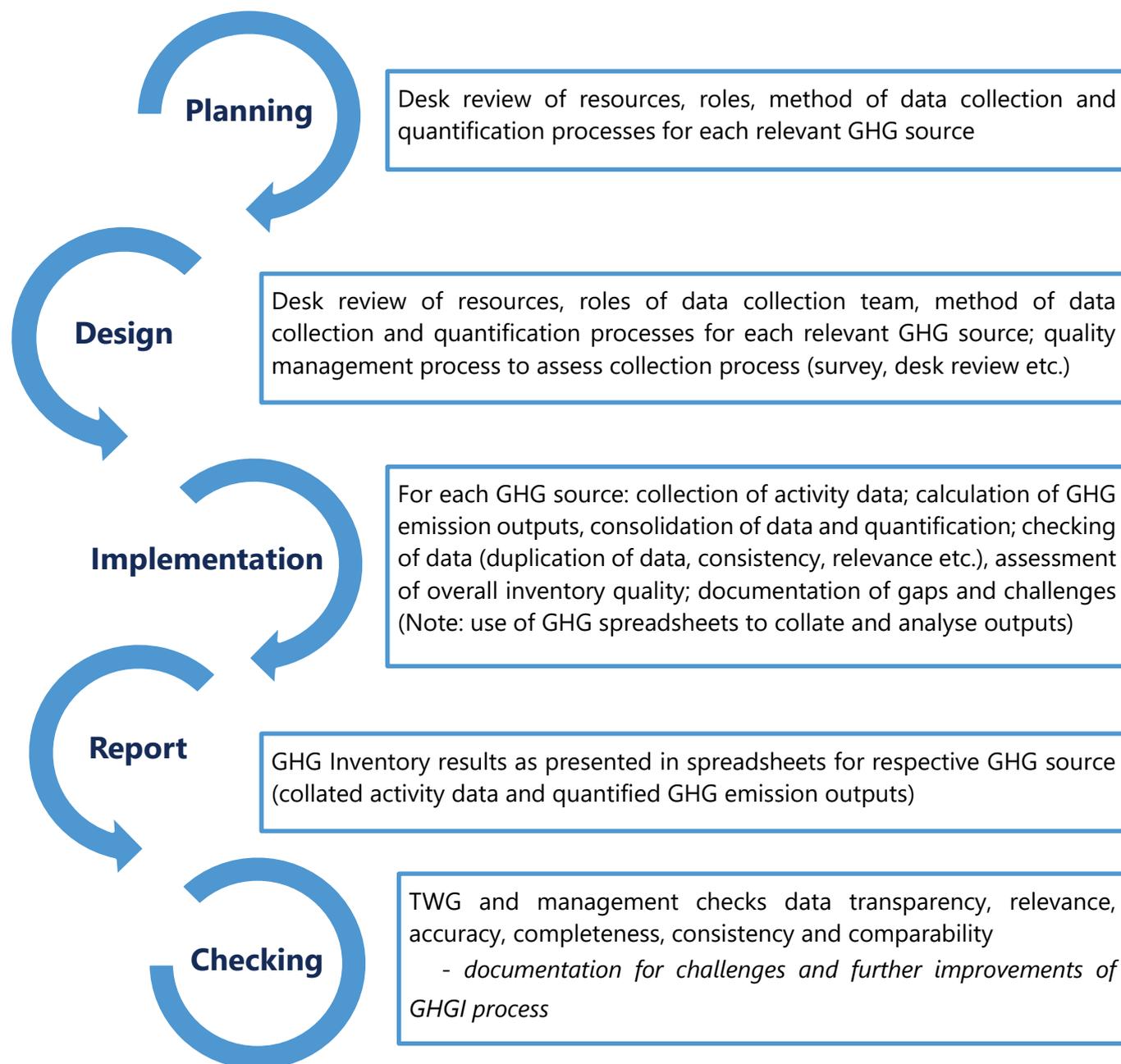


Figure 3: Davao City GHGI Overall Process Flow and Methodology ¹⁷

16 Note: Tabulated results and analysis extracted from the Davao City Greenhouse Gas Inventory Results, 2017

17 With reference from the GHGI User’s Manual, Climate Change Commission

1. Stationary Combustion

Combustion of fuels in stationary (non-transport) combustion sources results in the following greenhouse gas (GHG) emissions: carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). Sources of emissions from stationary combustion include boilers, heaters, furnaces, kilns, ovens, flares, thermal oxidizers, dryers, and any other equipment or machinery that combusts carbon bearing fuels or waste stream materials.¹⁸

In Davao City's GHG Inventory, stationary combustion fuels are those used by residential and commercial sectors for cooking, lighting, heating and cooling within the geopolitical boundaries of the LGU.¹⁹

Based on the GHG Inventory for 2017, results showed that the residential stationary combustion has a total of 534,040.8 tonnes CO₂e; emission sources are mainly from wood (77.65%) and charcoal (20.89%). In parallel, GHG inventory in the commercial stationary combustion reported that a significant amount of GHG emissions comes from cooking rather than for power generation, and that 91.24% of GHG Emissions at 72524.06 tonnes CO₂e is attributed to the use of charcoal or biomass for cooking.

A. Quantification of Residential Stationary Combustion

Methodology

1. The TWG reviewed possible primary and secondary sources of data from the City Planning and Development Office, Philippine Statistics Office and others.
2. The most recent data came from the Participatory Rural Appraisal Report in 2015. The TWG analysed and used this baseline to come up with the most relevant information which can be used in the quantification of GHG emissions from the residential stationary combustion fuels. In order to be as accurate as possible, ratio and proportion of households were computed using the information on the different cooking facilities such as firewood, kerosene, LPG and charcoal from the PRA 2015 results. Assumptions were used to be able to compute the projected values: each household uses 3.5 kg of firewood in a day (43 kg/year), 100 liters of kerosene per year, 2 tanks (weigh:11 kgs/tank) of LPG per year; 2 kgs of charcoal per day (24 kg/year). And also based on the growing trend among rural and urban household in terms of fuel usage: *more households in far-flung barangays are using wood, charcoal, and kerosene for cooking, due to availability of wood; high usage of kerosene for cooking is particularly higher in far-flung areas due to lack of electricity, high rates /fluctuating prices of LPG and electricity, accessibility and affordability of kerosene in many far-flung areas of the City.*

18 https://www.epa.gov/sites/production/files/2016-03/documents/stationaryemissions_3_2016.pdf

19 Climate Change Commission GHGI User's Manual

3. The TWG data collection team prepared the summary of the projected data based on the suggestions format of GHG Datasheet 3.1. List of Households included in the inventory per in 11 administrative districts of Davao City.²⁰ The data on household use of electricity from the PRA 2015 was not included in the computation since a much more recent and accurate data was provided by the Davao Light and Power Company.

Activity Data

Using Data Sheet 5.1, the information on fuel consumption of the residential sector was collated; data was disaggregated according to types of fuel for cooking such as firewood, kerosene, LPG, and charcoal.

- Based on 2015 PSA Census, 2017 total population was projected at 1,708,972 and the household population at 427,42 multiplied to the annual consumption of firewood, kerosene, LPG, and charcoal [see Table 2].
- Annual residential stationary combustion of 11 administrative districts in Davao City revealed that the most prominent cooking practices in the households are (1) firewood (2) charcoal, (3) LPG and (4) Kerosene. According to the report, the use of firewood is most common among rural or far-flung households in Davao City.
- PRA 2015 trend: more households in far-flung barangays are using wood, charcoal, and kerosene for cooking, due to availability of wood; high usage of kerosene for cooking is particularly higher in far-flung areas due to lack of electricity, high rates /fluctuating prices of LPG and electricity, accessibility and affordability of kerosene in many far-flung areas of the City.

Table 4. Types of Household Cooking Facilities in the Administrative Districts of Davao City

District	Projected Population 2017	Estimated Number of Households 2017	Cooking Facility of Households				
			Firewood	Kerosene Stove	LPG Stove	Electric Stove	Charcoal
Poblacion	182,223	45,556	7,289	4,556	23,233	1,367	9,111
Talomo	438,093	109,523	31,762	9,857	53,666	3,286	10,952
Agdao	107,025	26,756	4,013	4,013	12,040	803	5,886
Buhangin	306,756	76,689	15,338	2,301	46,780	3,068	9,203
Bunawan	159,179	39,795	17,908	5,571	11,540	1,592	3,184
Paquibato	46,846	11,711	11,243	117	117		234
Baguio	35,449	8,862	7,444	177	1,152	89	No data
Calinan	96,359	24,090	20,476	482	2,650	241	241
Marilog	54,630	13,657	13,009	98	470	34	46
Toril	155,433	38,858	21,372	2,720	10,880	777	3,109
Tugbok	126,980	31,745	21,456	851	6838	613	1,987
TOTAL	1,708,973	427,242	171,310	30,743	169,366	11,870	43,953

Source: CPDO, Participatory Rural Appraisal 2015

Table 5. Annual household consumption according to Emission Sources for Residential Sector, 2017

Types of Fuel	Annual Volume of Emission	Unit
Wood or Wood Waste (Biomass, International)	218,848,525	kg
Kerosene (International)	3,074,300	l
Propane or Liquefied Petroleum Gases (International)	5,589,078.00	kg
Charcoal (Biomass, International)	32,085,690.00	kg

Emission Factor

Using the spreadsheet in quantifying GHG emissions, the disaggregated activity data was quantified according to emission sources and annual volume measured in liters and kilograms. The emissions factors used to determine the total CO₂ Emissions (tonnes CO₂) were based on IPCC 2006 GHGI guidelines.

Table 6. Total Greenhouse Gas Emissions in the Residential Sector, 2017

Fuel Type	Quantity	Units	CO ₂ Emission Factor	Units	CO ₂ Emissions (tonnes CO ₂)	CH ₄ Emission Factor	Units	CH ₄ Emissions (tonnes CH ₄)	N ₂ O Emission Factor	Units	N ₂ O Emissions (tonnes N ₂ O)	GHG Emissions (tonnes CO ₂ e)	Proportion of Emissions
Wood or Wood Waste (Biomass, International)	218848525.0	kg	1.75E+00	kg/kg	382372.14	4.68E-03	kg/kg	1.02E+03	6.24E-05	kg/kg	1.37+01	414,668.93	77.65%
Kerosene (International)	3074300.0	l	2.52E+00	kg/L	7745.32	3.50E-04	kg/L	1.08E+00	2.10E-05	kg/L	6.46-02	7,792.61	1.46%
Propane or Liquefied Petroleum Gases (International)	5589078.0	kg	2.98E-03	kg/kg	16.68	2.37E-07	kg/kg	1.32E+03	4.73E-09	kg/kg	2.64-05	16.73	0.00%
Charcoal (Biomass, International)	32085690.0	kg	3.30E+00	kg/kg	106011.12	5.90E-03	kg/kg	1.89E+02	2.95E-05	kg/kg	9.47-01	111,562.51	20.89%

Source: GHGI 2017, Davao City

B. Commercial Stationary Combustion

Methodology

1. The lack of an updated secondary data and reports on types on the amount of fuel consumption among commercial establishments in Davao City prompted for the conduct of an actual survey. The sampling was conducted in two categories — a list of Major Food Chains in Davao City and a list of kitchenettes and eateries, hotels and restaurants registered in Davao City from the Local Business Bureau.
2. To find out about the weekly average consumption of LPG and Coal for cooking and fuel for generators among commercial establishments in Davao City, the team led by the CPDO-Research and Statistics Department interviewed 7 Major Food Chains and 5 kitchenettes and eateries, 5 hotels and 5 restaurants. The data gathering was conducted via phone for Major Food Chains and face-to-face interviews for kitchenettes and eateries, hotels and restaurants.
3. However, information or data on the annual consumption of diesel to run generators of the business establishments in Davao City was obtained from the Davao Light and Power Company upon request.
4. GHG Quantification: The data was further quantified to get the annual consumption of fuel usage in the commercial sector.

Table 7. Annual Volume of Fuel Consumption among Major Food Chains, Restaurants, Eateries and Hotels in Davao City, 2017

District of Barangay	Data Source Identifier (e.g. Business Survey Number)	Type of Data (e.g. Individual Business Surveys, National Census Averages, Other) - please select from drop-down	Application (e.g. cooking, lighting, generators) - please select from drop-down	Fuel Type (please select from drop-down)	Annual Total Consumption	Units (e.g. litres, kg, tonnes, m ³) - metric only
Davao City	Davao Light and Power Company	Other (e.g. Fuel Supplier Totals)	Generator(s)	Diesel (International)	293,518.00	l
	CPDO-RSD	Individual Business Surveys	Cooking	Propane or LPG (International)	2,062,571,536.24	kg
				Charcoal (Biomass, International)	20,858,124.00	kg

Source: GHGI 2017, Davao City

Emission factor

For Commercial Stationary Combustion, Emission Factor based on the IPCC 206 Guidelines for National Greenhouse Gas Emissions. Using Data Sheet 5.1, the data was collated according to emission sources: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and bulk GHG emissions are as follows:

Table 8. GHG Emissions in the Commercial Sector per Fuel Type

Fuel Type	Quantity	Units	CO ₂ Emission Factor	Units	CO ₂ Emissions (tonnes CO ₂)	CH ₄ Emission Factor	Units	CH ₄ Emissions (tonnes CH ₄)	N ₂ O Emission Factor	Units	N ₂ O Emissions (tonnes N ₂ O)	GHG Emissions (tonnes CO ₂ e)	Proportion of Emissions
Diesel (International)	293,518.0	l	2.68E+00	kg/L	785.60	3.61E-04	kg/L	1.06E-01	2.17E-05	kg/L	6.36E-03	790.25	0.99%
Propane or Liquefied Petroleum Gases (International)	2,062,571,536.2	kg	2.98E-03	kg/kg	6156.01	2.37E-07	kg/kg	4.88E-01	4.73E-09	kg/kg	9.76E-03	6172.26	7.77%
Charcoal (Biomass, International)	20,858,124.0	kg	3.30E+00	kg/kg	68915.24	5.90E-03	kg/kg	1.23E+02	2.95E-05	kg/kg	6.15E-01	72524.06	91.24%

Source: GHGI 2017, Davao City

Quality control/quality assurance

In terms of quality control and quality assurance, the following protocols were implemented by the data collection team:

- (1) Activity data collected were cleaned and checked for consistency/inconsistencies by the respective heads of CPDO, as members of the GHG data collection team and TWG.
- (2) Data were then collated by the CPDO-Project and Evaluation Department for another round of checking and quality assurance
- (3) The spreadsheet was also checked by an external member of the GHG -TWG for fact-checking and analysis of trends and consistencies. TWG member, Dr. Doris Montecastro from the Ateneo de Davao University provided technical support in reviewing the initial results.

Uncertainty assessment

Data may be under-reported:

- Data collected from the Local Business Bureau in 2017 lack disaggregated information on the nature of business per establishment and were only categorized as manufacturing and industry.
- The sampling frame for food businesses was not stratified into subcategories e.g. Food distributor of major food chains and commissaries. Some major food chains included in the sampling did not do actual food preparation and cooking in their premises.

Further improvements

- Further improvement in the collection of data by identifying the nature of business for the list of establishments in Davao City from the Business Bureau.
- To get the exact amount of consumption on fuel types by the major food chains, stratified random sampling needs to be used in identifying list of samples; as consumption of major food chains varies, not all establishments do cooking and food preparation on-site — major food chain business such as KFC, Jollibee and McDonalds are catered by food commissaries²¹ or, strategically located per area of business, or region. Hence, to get a good representative of the consumption of establishments in terms of LPG and coal, further refinements on the sampling technique will have to be applied in the next round of data collection.
- In collecting data for the residential stationary combustion, household survey and profiling on types of fuel usage need to be done at the barangay level to get a more accurate value and representation (i.e. rural vs. Urban households).

21 A **commissary** is a licensed or permitted **food** service establishment that provides required services to a mobile **food** dispensing vehicle (MFDV). ... A **commissary** provides the necessary support for the MFDV to operate in a safe and sanitary manner

2. Mobile combustion

Greenhouse gas (GHG) emissions are produced by mobile sources as fuels are burned. Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) are emitted directly through the combustion of fuels in different types of mobile equipment.

GHG Inventory for mobile combustion in Davao City accounted for 1,405,481.84 tonnes CO₂e. Of the total volume of emissions, 67.25% comes from the on-road diesel and gasoline fuel at 32%.

Methodology

The only available data on mobile combustion is based on the historical demand of petroleum products in Region XI (2017), secured from the Department of Energy, Mindanao Field Office.

A meta analysis and assumptions were made to extract the annual fuel consumption of Davao City based on the reported Regional historical demand of petroleum products namely gasoline, diesel and fuel oil in Region XI in 2017.

- PSA reports that 69.5%²² of the total revenue of Davao City in 2017 is attributed to Davao City's economic activities.
- Since fuel sales are also an indicator of Davao City's income, the annual fuel consumption of Davao City were disaggregated from the total region XI demand for petroleum products (i.e. gasoline, diesel and fuel oil) using the 69.5% baseline (See Box 1).

Activity data

The annual consumption per litre computation:

Gasoline projected demand 2017 (2424.34 MB) x 0.1172 metric tons gasoline x 69.5% (0.695) Davao City share x 1000 = 197,472,190.36 kg/liter

The conversion of data from thousand barrel liters is based on the following unit weight and measurement:²³

- a. 1 barrel of Gasoline is equal to .1172 metric tons.
- b. 1 barrel of Diesel is equal to .1341 metric tons.
- c. 1 barrel of Fuel Oil is equal to .1364 metric tons.
- d. 1 metric ton is equivalent to 1000 liters.

The same equation was used to get the annual fuel consumption of diesel and fuel oil.

²² PSA 2017. Downloaded at <http://rso11.psa.gov.ph/sites/default/files/attachments/2017%20RSET%20Davao%20Region.pdf>

²³ Note: The data based on historical demand of fuel is based on Davao Region. To account the Davao consumption only; 69.5% of the total consumption is accounted to Davao City based on the Davao City's percentage revenue of the total revenue of Region XI. Thus, conversion of data is done in a mathematical approach (Source: extension.iastate.edu)

Box 1: Annual Fuel Consumption derived from the Region XI Historical Demand of Petroleum Products and 69.% revenue income of Davao City

	GASOLINE	DIESEL	FUEL OIL
	2424.34	3789.26	159.65
1000			
	Source: PSA baseline 2017		
	1. Davao City is the largest revenue earner with a 69.5%		
	Share of total revenue generated in the region.		
Note:	1 bbl = .1172 metric tons (Gasoline)	1mt =	1,000 L = 1,000kg
	1bbl= .1341 metric tons (Diesel)		
	1bbl= .1364 metric tons (Fuel Oil)		
	197,472,190.36	kg/l	
	353,157,137.37	kg/l	
	15,134,500.70	kg/l	
	Conversion of Thousand Barrels into Barrel is multiplied by the number		

Emission factor

In computing for GHG, Emission Factors are based on recommended EF for carbon dioxide, methane and nitrous oxide by IPCC 2006 and as adapted by Climate Change Commission GHG Manual. Only emissions from carbon dioxide were factored in.

Table 9. GHG Emissions from the Commercial Stationary Combustion by fuel type

Fuel Type (if only Fuel Type and Amount is Available)	CO ₂ Emission Factor	Units	CO ₂ Emissions (tonnes CO ₂)	GHG Emissions (tonnes CO ₂ e) %	Proportion of Emissions
Gasoline/Petrol	2.272	kg CO ₂ / liter	448567.27	448567.27	31.92%
On-Road Diesel Fuel	2.676	kg CO ₂ / liter	945164.45	945164.45	67.25%
Residual Fuel Oil (3s 5 and 6)	2.939	kg CO ₂ / liter	11750.00	11750.00	0.84%

Source: GHGI 2017, Davao City

Quality control/quality assurance

To ensure quality data the following consideration were put in placed:

- Assumed that all vehicles operating within the LGU frequented the fuel service providers listed in the collected data;
- Subtracted diesel consumption for stationary combustion (e.g. for back-up generators) from the total fuel sales data provided by the fuel suppliers; since these fuel suppliers also serviced residential and commercial customers for stationary sources; and
- Assumed that vehicles registered within the LGU are not frequently purchasing fuel from suppliers operating outside of the LGU.

Uncertainty assessment

- Disaggregation of Davao City's petroleum consumption for 2017 from the aggregate Regional demand using the baseline of 69.5% revenue earnings might have generated underreporting or bloating of the actual figure.
- Residual fuel: not specified in the GHG manual. The team relied on the google definition of the words "residual fuel" which is translated as fuel oil

Further improvements

- There is a need to design an activity data that would capture disaggregated yearly consumption of petroleum for Davao City only;
- The collection of data on distance traveled is the most appropriate measurement to compute mobile combustion. But it is challenging to identify which vehicles are plying within Davao City boundaries with porous entrance and exits from Davao to other local government unit areas. As Davao is the center of trade in the Mindanao region, vehicles from other LGUs visit Davao daily. There are uncertainties in the reliability of registered private vehicles in Davao since there are vehicles that are registered in Davao City but not owned by Davao City residents;
- Emissions from public vehicles such as buses plying within and around city limits are easier to calculate compared to private vehicles; and
- Calculating GHG based on Fuel sales of petrol stations/business is reliable and also a preferred method for the team.

3. Electricity consumption

According to the Davao Light and Power Company, demand for energy supply in Davao City has been increasing in the last 3 years. About 60-70% of the demand comes from the Commercial and Industrial sector.

Table 10. Monthly Electricity Consumption of Davao City per sector from 2016 to 2018

Type of Consumers	2016 monthly			2017 monthly consumption			2018 monthly		
	No. of Connections	kWh	%	No. of Connections	kWh	%	No. of Connections	kWh	%
Residential	257,319	50,442,484	31.38	270,736	51,229,136	30.16	285,790	55,258,306	30.32
Commercial	39,147	18,093,647	11.25	41,542	18,453,924	10.86	43,343	19,523,096	10.71
Industrial	3,671	89,396,834	55.61	3,065	97,341,303	57.30	4,239	104,537,266	57.31
Other: Street Lights	80	2,833,565	1.76	85	2,851,467	1.68	81	2,903,979	1.59
Total	300,217	160,766,530	56	315,428	169,875,830	100	333,453	182,222,646	98

Source: Davao Light and Power Company

Note: • Type of consumers are based on the total appliance load upon application.

- Lower than 20 kW that are not residential are classified under commercial.

- Larger than 20 kW are classified as industrial.

• % = (kW per type of consumer/Total kW) x 100

Davao City GHG Emissions for Electricity Consumption is about 616,999.5 tonnes CO₂e. The bulk of the emissions comes from the commercial and industry sector (55%) followed by the residential sector (24%) and boilers(19.27%) and streetlights (1.4%)

Methodology

Electricity Consumption refers to electricity consumed within the geopolitical boundaries of the Davao City LGU.

Data on total community electricity consumption were secured from the Davao Light Power Company (sole electricity provider of Davao City). While, additional data about establishment using boilers were secured from the City Engineer’s Office on the assumption that it is kept running for 24 hours and 7 days a week.

Activity data

Emissions were categorized into residential, commercial and industrial, and others which refer to street lights. The annual consumption of electricity based on types of sectors where secured from the DLPC (Davao Light Power Company).

The team also considered the energy mixed sourcing in generating electricity for Mindanao which is 40% coal and 60% hydro energy.

Calculated as: 51,229.136 monthly consumption of electricity among residents multiplied by 12 months and multiplied by 0.40 coal energy-powered grid to get the annual residential electricity consumption.

Of the total annual electricity consumption in 2017, 40% of the total consumption from coal was used in the calculation.

Table 11. Residential Annual Electricity Consumption, Davao City 2017

Residential Electricity Consumption - Community (kWh)					
District or Barangay <i>- please select from drop-down</i>	Data Source Identifier (e.g. Residential Survey Number or Utility Name and Source Identifier)	Data Type – (e.g. Individual Household Surveys, National Census Averages, Other) - please select from drop-down	Actual Annual Electricity Consumption (kWh) - enter "N/A" if electricity data is estimated	Units (e.g. kWh/household)	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)
Davao City	Davao Light and Power Company	Electricity Utilities Provider	245,899,852.80	kWh	Only 40% of the total consumption were calculated since it is coming from the coal power plant and diesel power plant. The other 60% of the total consumption were supplied by the hydro electric power.

Source: GHGI 2017, Davao City

Table 12. Commercial Annual Electricity Consumption, Davao City 2017

District or Barangay - please select from drop-down	Data Source Identifier (e.g. Commercial Survey Number or Utility Name and Source Identifier)	Data Type - (e.g. Individual Business Surveys, National Census Averages, Other) - please select from drop-down	Actual Annual Electricity Consumption (kWh) - coal, diesel and hydro power	Estimated Annual Consumption for Emissions Source - 40% coal and diesel generated source	Units (e.g. kWh)
Davao City	Davao Light and Power Company - Commercial and Industrial	Electricity Utilities Provider	1,389,543,000.00	555,817,090	kWh

Source: GHGI 2017, Davao City

Table 13. Annual Electricity Consumption from Streetlights, Davao City 2017

District or Barangay - please select from drop-down	Data Source Identifier (e.g. Streetlights, MRT line, Utility Name and Source Identifier)	Data Type - (e.g. Individual Business Surveys, National Census Averages, Other) - please select from drop-down	Actual Annual Electricity Consumption (kWh) mixed source - coal, diesel, hydro power	Estimated Annual Consumption for Emissions Source- 40% coal and diesel	Units (e.g. kWh/ household)
Davao City	DLPC - Streetlights	Electricity Utilities Provider	34,217,605	13,687,042	kWh
Davao City	City Engineer's Office	Business Surveys	488,231,645	195,292,658	kWh

Source: GHGI 2017, Davao City

Emission factor

Philippines (National default) Emission Factor was used in quantifying GHG Emissions.

For electricity, Davao City's total GHG emissions are at 616,999.5 tonnes CO₂e. The bulk of the emissions comes from the commercial and industry sector (55%) followed by the residential sector (24%), boilers (19%) and public streetlights (20%).

Table 14. GHG Emissions from Electricity Consumption per sectors, Davao City

	Quantity kWh	CO ₂ Emission Factor	CO ₂ Emissions (tonnes CO ₂)	CH ₄ Emission Factor	CH ₄ Emissions (tonnes CH ₄)	N ₂ O Emission Factor	N ₂ O Emissions (tonnes N ₂ O)	Total GHG Emissions in District/Barangay (tonnes CO ₂ e)	Proportion of Emissions
Residential	245,899,853	0.609 kg GHG/kWh	149728.4	9.36E-06	2.30	7.13E-06	1.75	150,257.2	24.35
Commercial/Industrial	555,817,090	0.609 kg GHG/kWh	338437	9.36E-06	5.20	1.50E+05	3.96	338,965.8	54.93
Others: streetlights (DLPC)	13,687,042	0.609 kg GHG/kWh	8334.0	9.26E-06	0.13	7.13E-06	0.10	8,862.8	1.46
Others: City Engineers	195,292,658		118913.7	9.26E-06	1.83	7.13E-06	1.39	118,913.7	19.27
								616,999.5	1

Source: GHGI 2017, Davao City

Quality control/quality assurance

TWG recommended the disaggregation of the electricity consumption for Mindanao into coal and diesel and hydro upon review. The team revised the activity data and segregated the 2017 electricity consumption accordingly.

Uncertainty assessment

Not evaluated

Further improvements

Comprehensive data needs to be collected for off-the-grid areas in Davao City including types of fuel used for lighting.

4. Agriculture

Agriculture is the backbone of the social economy. It provides sufficient food and livelihood for billions of people around the world. Despite its importance in people's general welfare, food production processes has significant impacts on the environment through deforestation and water pollution. It's also a major contributor of greenhouse gas emissions. As countries work to cut their emissions overall, agricultural emissions need to also cut back.²⁴

Agriculture is a major contributor to global emissions of the greenhouse gases (GHGs) that drive climate change. The international community has adopted a goal to restrict global warming to 2oC above pre-industrial levels. Temperature rise above 2oC will produce increasingly unpredictable and dangerous impacts for people and ecosystems, but particularly for agricultural systems. Impacts on the agricultural sector that are already occurring but expected to intensify include increased irrigation water needs, increased spread of animal and crop diseases and pests, reduced forage quality, and reduced crop and pasture yields.²⁵ These impacts stem from changes in surface temperatures, the timing of seasons, and in the frequency and severity of severe weather events, such as droughts, floods, and heatwaves.²⁶

Achieving the 2oC goal will require drastic reductions in GHG emissions. The agricultural sector plays an important role in reduction climate change impacts. A wide range of agricultural activities emit GHGs directly contributed about 11%³ of total global anthropogenic emissions in 2010, and roughly 60% of all nitrous oxide (N₂O) emissions and 50% of all methane (CH₄) emissions in 2007.²⁷ Land use change (LUC), caused by the conversion of native habitats to farmland, contributes a comparable amount of emissions.²⁸ Finally, the production of agricultural inputs and various downstream activities, such as the processing and transport of agricultural products, contributes a further 3 - 6 % of global emissions.²⁹

Davao City's main economic driver is agriculture, hence, mitigation measures need to account for the GHG emissions of the sector, at the same time steer the city's economic development sustainably.

As an effort to initiate the first the GHGI in Davao City, the GHG-TWG started with the inventory of emissions from agriculture through quantifying rice production emissions in various cultivation practices. As reported, GHGI emissions output in the agricultural sector reached 12,847.8 tonnes of CO₂e. Of the total proportion of emissions, about 65.6% were from cultivating irrigated rice during the wet season; while less than half of the emissions were from cultivating rainfed rice in the wet season (31.5%). While rice cultivation using rainfed rice during the dry season is at 20% of the overall emissions. Emissions from crop residues were minimal at 2.7%.

The GHGI emissions from livestock production is much higher than emissions from crop or rice

24 World Resources Institute. Downloaded at <https://www.wri.org/blog/2019/07/5-questions-about-agricultural-emissions-answered>

25 Easterling et al., 2007. Cited in GHG Protocol Agricultural Guidance

26 GHG Protocol Agricultural Guidance. Downloaded at

https://ghgprotocol.org/sites/default/files/standards/GHG%20Protocol%20Agricultural%20Guidance%20%28April%2026%29_0.pdf

27 Smith et al., 2007a. Cited in GHG Protocol Agricultural Guidance

28 Houghton, 2012. Cited in GHG Protocol Agricultural Guidance

29 Vermuelen et al., 2012. Cited in GHG Protocol Agricultural Guidance

production at 305,171.5 tonnes of CO₂e. Of the total proportion, the highest recorded emissions are from swine production (32%), followed by buffalo (24.4%), cattle (20.8%), and poultry (19.3%). Emissions from goat raising are lowest at 3.7%.

Methodology

The members of the research team secured secondary data from the City Agriculturist Office such as total hectares under agricultural crop/rice production, including growing season and irrigation practices, and livestock headcounts of farms inside the LGU’s geopolitical boundaries. This data also includes the land area designated to each crop-type and corresponding irrigation practice and growing season (e.g. rice, dry season, irrigated), and livestock headcounts for the LGU by animal type.

Headcount (livestock) refers to the average population in a given year based on the census of animals conducted by the City Veterinarian’s Office.

Activity data

GHG emissions were calculated using the latest crop data and livestock from the City Agriculturist’s Office.

Table 15. Annual Rice Production based on method of cultivation, Davao City 2017

District or Barangay	Data Source Identifier	Type of Data	Application (Crops)	Total Hectares Under Production (hectares, ha)
Davao City	City Agri Office	Data from Government Agricultural Agency	Rice (Wet Season, Irrigated)	923
Davao City	City Agri Office	Data from Government Agricultural Agency	Rice (Wet Season, Rainfed)	1039
Davao City	City Agri Office	Data from Government Agricultural Agency	Rice (Dry Season, Rainfed)	22
Davao City	City Agri Office	Data from Government Agricultural Agency	Crop Residues (tonnes of dry weight)	6845

Source: GHGI 2017, Davao City

Table 16. Total number of livestocks based on 2017 headcount, Davao City

District or Barangay	Data Source Identifier	Type of Data	Application (Livestocks)	headcount
Davao City	City Vet Office	Data from Government Agricultural Agency	Buffalo	38642
Davao City	City Vet Office	Data from Government Agricultural Agency	Cattle	36318
Davao City	City Vet Office	Data from Government Agricultural Agency	Swine	229854
Davao City	City Vet Office	Data from Government Agricultural Agency	Goat	46867
Davao City	City Vet Office	Data from Government Agricultural Agency	Poultry	6905140

Source: GHGI 2017, Davao City

Emission factor

Emission Factor and quantified results are as follows:

Table 17. GHG Emission from Rice Production as per types cultivation, Davao City

	CH ₄ Emission Factor	Units	CH ₄ Emissions (tonnes CH ₄)	N ₂ O Emission Factor	Units	N ₂ O Emissions (tonnes N ₂ O)	GHG Emissions (tonnes CO ₂ e)	Proportion of Emissions
Rice (Wet Season, Irrigated)	326.0	kg GHG/hectare	300.93	0.00	kg GHG/hectare		8426.1	65.6%
Rice (Wet Season, Rainfed)	139.0	kg GHG/hectare	144.00	0.00	kg GHG/hectare		4045.3	31.5%
Rice (Dry Season, Rainfed)	52.0	kg GHG/hectare	1.13	0.00	kg GHG/hectare		31.7	20.0%
Crop Residues (tonnes of dry weight)	0.0	kg GHG/ton	-	0.19	kg GHG/ton	1.30	344.6	2.7%

Source: GHGI 2017, Davao City

Table 18. GHG Emissions from Livestock Production, Davao City

		CH ₄ Emission Factor	Units	CH ₄ Emissions (tonnes CH ₄)	N ₂ O Emission Factor	Units	N ₂ O Emissions (tonnes N ₂ O)	GHG Emissions (tonnes CO ₂ e)	Proportion of Emissions
Buffalo	38642	57.0	kg GHG /head	2,202.59	1.25	Kg GHG /head	48.30	74,472.80	24.4%
Cattle	36318	48.0	kg GHG /head	1,1743.26	1.47	Kg GHG /head	53.39	62,959.10	20.8%
Swine	229854	8.0	kg GHG /head	1,838.83	0.76	Kg GHG /head	174.69	97,779.90	32.0%
Goat	46867	5.2	kg GHG /head	244.65	0.35	Kg GHG /head	16.40	11,197.00	3.7%
Poultry	6905140	0.0	kg GHG /head	138.10	0.03	Kg GHG /head	207.15	58,762.70	19.3%

Source: GHGI 2017, Davao City

For crops, 12,847.8 tonnes of **CO₂e** were released to the environment. Of the total proportion of emissions, about 65.6% were from cultivating irrigated rice during the wet season. While less than half of the emissions were from cultivating rainfed rice in the wet season (31.5%) and as well as rainfed rice during the dry season (20%). Emissions from crop residues were minimal at 2.7%.

For livestock, about 305,171.5 tonnes of CO₂e of GHG Emissions were recorded. Of the total proportion, the highest recorded emissions are from swine production (32%), buffalo (24.4%), cattle (20.8%), poultry (19.3%). Emissions from goat raising are lowest at 3.7%.

Quality control/quality assurance

The data obtained from the City Agriculturist’s Office were rigorously researched and checked by the concerned team.

Uncertainty assessment

Not evaluated by the TWG.

Further improvements

Comprehensive data on other major crops, backyard aquaculture farms and land-use changes or conversion will need to be factored in.

5. Solid waste

According to the report on Waste Analysis and Characterization Study (WACS), Davao City generates 900 tons per day making it the biggest waste generator in Davao Region. Every person in the city contributes half a kilogram of garbage waste per day.

Out of 182 barangays in the city, only 112 are reached by the garbage trucks of the City Environment and Natural Resources Office (Cenro).³⁰ The research also revealed that 50% of the generated garbage of the city is biodegradable or capable of being decomposed by bacteria or other living organisms. The collected garbage is deposited at the 11-hectare sanitary landfill in Tugbok District. The city also processes biodegradable waste through composting in its facility. The composting facility can process five tons of biodegradable wastes one. Materials recovery facilities for recyclable waste are also set up in 14 barangays,³¹ although a few are fully functional.

Methodology

In Davao City, solid waste refers to municipal solid waste (“MSW”) generated within the LGU’s geopolitical boundaries and that may cause GHG emissions inside the LGU’s geopolitical boundaries

Emissions from waste facilities were calculated using the ICLEI-based waste quantification methodology.

The team obtained secondary data from the Davao City Environmental and Natural Resources Office. The data was based on CENRO’s latest Waste Characterization Study in Davao City.

Activity data

Solid waste analysis of data based on ICLEI method are as follows:

a.) General solid waste data in sanitary landfill:

In calculating GHG values for a specific type of solid waste management in Davao City, IPCC 2006 classification was referred to RA 9003 classification which most LGUs are familiar with³² — sanitary landfills are classified as anaerobic, managed; while open dumpsites are labeled as unmanaged, deep type.

³⁰ Hidalgo: Garbage disposal, a problem. <https://www.sunstar.com.ph/article/1786149>

³¹ Ecological Profile of Davao City

³² GHGI Manila page 33

Table 19. Volume of Collected and Uncollected Waste Per Capita based on IPCC Classification, Davao City

Data Source Identifier	District/Barangay	Total Population of District/Barangay	Waste Per Capita (If Estimating Total Solid Waste)--	Total Solid Waste for District/Barangay (Estimate)	Total Solid Waste	Fraction of Total Solid Waste Disposed in Solid Waste Disposal Sites	Amount Sent to Landfills in District/Barangay	Fraction of Total Waste Sent to Specific Landfill Type -	Specific Landfill Type (IPCC)
		<i>inhabitants</i>	<i>Tonnes /capita /year</i>	<i>tonnes</i>	<i>tonnes</i>	<i>%</i>	<i>tonnes</i>	<i>%</i>	
DAVAO CITY (Collection Area)	Davao City	1,461,480	0.21	306,910.8	-	69%	211768.5	100%	Managed - anaerobic
DAVAO CITY (Non-collection Area)	Non-collection Area	246,629	0.21	51,792.1		69%	35736.5	100%	Un-managed - deep

Source: GHGI 2017, Davao City

b.) General solid waste composting data with ICLEI method:

Table 20. Total Amount of Solid Waste Composted, Davao City

Data Source Identifier	Total Population	Waste Per Capita (If Estimating Total Solid Waste)-	Total Solid Waste for District/Barangay (Estimated)	Total Solid Waste (Actual) for District/Barangay	Fraction of Total Solid Waste Sent for Composting - default value of 10% for Philippines -	Fraction of Total Solid Waste Sent for Anaerobic Digestion Facilities -	Fraction of Total Solid Waste Sent for Open Burning -	Fraction of Total Solid Waste Other/Unspecified -	Amount of Total Solid Waste Composted -
	<i>inhabitants</i>	<i>Tonnes /capita /year</i>	<i>tonnes</i>	<i>tonnes</i>	<i>%</i>	<i>%</i>	<i>%</i>	<i>%</i>	<i>tonnes wet weight</i>
CENRO	1708972	0.21	358,884.1	358,884.1	10.0%	0.0%	2.0%	3.0%	10,766.5

Source: GHGI 2017, Davao City

Table 21. Amount of Solid Waste per type of disposal, Davao City

Amount of Total Solid Waste Sent to Anaerobic Digestion Facilities	Amount of Total Solid Waste Sent for Open Burning-	Amount of Total Solid Waste Sent for Other/Unspecified
<i>tonnes wet weight</i>	<i>tonnes wet weight</i>	<i>tonnes wet weight</i>
0.0	7,177.7	10,766.5

Source: GHGI 2017, Davao City

Emission factor

GHG quantification using the data from CENRO was done using the ICLEI method. In calculating GHG emissions, the IPCC 2006 default values were used according to specific types of solid waste management.

GHG Emissions from the biological treatment of solid waste in Davao City is at 18,285.1 tonnes CO₂e. Out of the total emissions, 78% are N₂O released and 22% are released from methane.

Table 22. GHG Emissions from Solid Waste (ICL EI Method), Davao City

Methane Recovered (tonnes) - enter 0 if no methane recovery used at site	Methane Released (tonnes)	Total CO ₂ Emissions (tonnes CO ₂)	Proportion of all GHG Emissions from Biological Treatment Emissions (%)	GHG Emissions (tonnes CO ₂ e)
0.0	143.55	4019.5	22.0%	4,019.5
	N ₂ O Released (tonnes)	Total CO ₂ Emissions (tonnes CO ₂)	Proportion of all GHG Emissions from Biological Treatment Emissions (%)	GHG Emissions (tonnes CO ₂ e)
	53.83	14265.6	78.0%	14,265.6
Methane Recovered (tonnes) - enter 0 if no methane recovery used at site	Methane Released (tonnes)	Total CO ₂ Emissions (tonnes CO ₂)	Proportion of all GHG Emissions from Biological Treatment Emissions (%)	GHG Emissions (tonnes CO ₂ e)
0.0	0.00	0.0	0.0%	0.0
	N ₂ O Released (tonnes)	Total CO ₂ Emissions (tonnes CO ₂)	Proportion of all GHG Emissions from Biological Treatment Emissions (%)	GHG Emissions (tonnes CO ₂ e)
	0.00	0.00	0.0%	0.00
18285.1				

Source: GHGI 2017, Davao City

In terms of combusted waste by open burning, GHG calculation yielded 49.2 CO₂e.

Table 23. GHG Emission from Solid Waste by Open Burning, Davao City

Emissions Source Indicator	Total Fossil Carbon in Combusted Waste (tonnes fossil carbon in dry waste)	Default Oxidation Factor (%) - IPCC default	Oxidation Factor Used in Calculation (e.g. Philippines national factor)	Conversion of Carbon to CO ₂ Factor (ratio)	Total CO ₂ Emissions (tonnes CO ₂)
Davao City	84.9	58.0%	58.0%	3.67	49.2
-		58.0%	58.0%	3.67	

Source: GHGI 2017, Davao City

Quality control/quality assurance

Checking of calculations was done. The CENRO data was based on the latest waste characterization study of the city.

Uncertainty assessment

Not evaluated due to lack of experience in accounting for uncertainties in this area.

Further improvements

- A more comprehensive data on solid waste is being processed. CENRO is putting together and finalizing a 7-year data/trend report on solid waste in Davao City.
- CPDO and GHG TWG will use the data to improve the reporting and quantification of GHG using the IPCC Method as well.

6. Wastewater

Wastewater as well as its sludge components can produce methane if it degrades anaerobically. The extent of methane production depends primarily on the quantity of degradable organic material in the wastewater, the temperature, and the type of treatment system. With increases in temperature, the rate of methane production increases. This is especially important in uncontrolled systems and in warm climates. Nitrous Oxide (N₂O) N₂O is associated with the degradation of nitrogen components in the wastewater, e.g., urea, nitrate and protein. Domestic wastewater includes human sewage mixed with other household wastewater, which can include effluent from shower drains, sink drains, washing machines, among others.³³

Based on 2017 GHGI emissions report in Davao City, the total GHG emissions from wastewater is around 186,067 tonnes CO₂e; where 99.65% is factored in as methane releases into the environment.

Methodology

Using Scope 1, wastewater generated in Davao City were collected. Secondary data on the type of wastewater management system among the residents in Davao City were provided by the City Health Office.

Activity data

Data shows that wastewater in residential areas were largely uncollected with no system of sewage and sludge treatment being done. Instead, wastewater is stored septic tanks at 86.4%, in an open pit at 10.5%, and residents with no facilities at 3.8%.

33 Greenhouse Gas Emissions From Wastewater Treatment Plants: A Case Study of Noida.
https://www.researchgate.net/publication/267554945_Greenhouse_Gas_Emissions_From_Wastewater_Treatment_Plants_A_Case_Study_of_Noida

Table 24. Mode of Wastewater treatment and disposal in Davao City, 2017

		CH ₄ Emissions Potential	N ₂ O Emission Potential	Is the system used in the LGU?	population using the %	Population using the system	
		See legend below	See legend below	Yes or No	%	Number	
Uncollected	Septic tanks			Yes	86.4%	1,476,059	
	Open Pits /latrines	dry climate, ground water table lower than latrine, small family (2-5 people)		Yes	10.5%	179,245	
		dry climate, ground water table lower than latrine, communal		No		- 0	
		wet climate/flush water use, ground water table than latrine		No		- 0	
		regular sediment removal for fertilizer		No		- 0	
	River Discharge	Stagnant oxygen deficient rivers and lakes		No		- 0	
		Rivers, lakes and estuaries		Yes	3.8%	65,600	
Collected	Untreated	River Discharge	Stagnant oxygen deficient rivers and lakes	No		- 0	
			Rivers, lakes and estuaries	No		- 0	
		Sewers (closed and under ground)			No		- 0
		Open Sewers			No		- 0
	Treated	Aerobic	Centralized aeribic well managed		No		- 0
			Centralized aeribic not well managed - overloaded		No		- 0
			Sludge anaerobic treatment in aerobic plant		No		- 0
			Aerobic shallow ponds		No		- 0
		Anaerobic lagoons	Shallow (less than 2 m)		No		- 0
			Shallow more than 2 m)		No		- 0
Anaerobic reactors			No		- 0		
Totals					101%	1,720,904	

Source: GHGI 2017, Davao City

Emission factor

GHG emissions from waste water and sewage such as methane and Nitrous Oxide were factored in using IPCC 2006 Guidelines for National Greenhouse Gas Inventories.

LGU specific data were used to calculate the LGU wastewater GHG emissions from the annual per capita protein consumption, the fraction of nitrogen in protein, factor of non-consumed protein added to wastewater, nitrogen removed from sludge, etc.

The total GHG emissions from wastewater is around 186,067 tonnes CO₂e where 99.65% are from methane.

Table 25. GHG Emissions from Residential Wastewater in Davao City, 2017

LGU	Total Emissions from CH ₄ Generated (in tonnes CO ₂ e)	Total Emissions from N ₂ O (in tonnes CO ₂ e)	Total LGU Wastewater GHG Emissions (All Sources, tonnes CO ₂ e)
General wastewater default and Custom Data for own LGU	185420.4	647.1	186067.5
General wastewater default and custom data for other sources (e.g. other LGU wastewater)	0.0	0.0	0.0
Total GHG emissions from Wastewater Treatment and Disposal			186067.5

Source: GHGI 2017, Davao City

Quality control/quality assurance

The data only covers residential wastewater in Davao City. The data were collected and updated by the City Health Office regularly, as part of their health and sanitation monitoring in all communities/barangays in Davao City.

Uncertainty assessment.

Not evaluated

Further improvements

The need for comprehensive data covering industrial and commercial wastewater treatment and discharge. The TWG team intends to work with the Environment Management Bureau of the Department of Environment and Natural Resources in this area.

Other means to collect data. There are private businesses that collect wastewater in residential and commercial areas for treatment and discharge — for a fee and the amount starts at Php 3,500 depending on the size of the septic tank.

Sampling in the next reporting may include data from these businesses. In a household of 2-5 people, septic tanks get filled up in more or less 10 years, the services of the private companies to collect the discharge are usually needed in this case.

7. Forest and land-use change

According to the United Nations Climate Change (UNFCCC), the forest has a very important role in combating climate change. As such, human activities, through land use, land-use change and forestry (LULUCF) activities, affect changes in carbon stocks between the carbon pools of the terrestrial ecosystem and between the terrestrial ecosystem and the atmosphere. Management and/or conversion of land uses (e.g. forests, croplands and grazing lands) affects sources and sinks of CO₂, CH₄ and N₂O.³⁴ The role of LULUCF activities in the mitigation of climate change has long been recognized. Mitigation achieved through activities in the LULUCF sector, either by increasing the removals of GHGs from the atmosphere or by reducing emissions by sources, can be relatively cost-effective.³⁵

Davao City's forest cover is only 16% of its total land area due to over exploitation causing further degradation or depletion of the city's forest resources.

Davao City GHG emissions (2017) from forest and land-use change is computed at 175,203.5 tonnes CO₂e. Whereas, GHG removal from Forestry and other sources are calculated at 1,485,732.76 tonnes CO₂e.

Methodology

The data on Forest and Land Use change were taken from the Davao City Land Use Plan report.

Activity data

Data shows that the conversion of forestland into agriculture is the most prominent source of GHG emission at 12,458 hectares.

34 UNFCCC. <https://unfccc.int/topics/land-use/workstreams/land-use--land-use-change-and-forestry-lulucf/land-use--land-use-change-and-forestry>

35 Ibid

Table 26. Forest and Land-use changes due to man-made activities, Davao City

District or Barangay - please select from drop-down	Data Source Identifier	Type of Data (e.g., Others) - please select from drop-down	Emission Type	Emission Source (please select from drop-down)	Annual Total Consumption	Units (please select from drop-down)
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Wood and Wood Products Harvesting	Fuelwood	2	cubic meters
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Wood and Wood Products Harvesting	Charcoal	51	cubic meters
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Wood and Wood Products Harvesting	Construction	30	cubic meters
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Changes in the Use of the Forestlands	Used for Agriculture	12,458	hectares
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Changes in the Use of the Forestlands	Left as Barren Areas	19	hectares

Source: GHGI 2017, Davao City

While GHG removal by carbon sink was also quantified: remaining brush lands account for 79,188 hectares of GHG removal source.

Table 27. Amount of carbon removed (in hectares) from the environment based on sources (carbon sink), Davao City

Forest Removal Sources						
District or Barangay - please select from drop-down	Data Source Identifier	Type of Data (e.g. , Others) - please select from drop-down	Removal Type (please select from drop-down)	Removal Source (please select from drop-down)	Annual Total Removal	Units (please select from drop-down)
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Protection Forest/ Old Growth/ Mossy/Pine/ Submarginal Mangrove	4,920	hectares
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Secondary Growth	13,651	hectares
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Brushland – for wood	79,188	hectares
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Tree Plantation – S. macrophylla	3,225	hectares
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Grassland	15,636	hectares

Source: GHGI 2017, Davao City

Emission factor

Emissions Factors for CO2 were based on the IPCC 2006 guidelines and adopted by the Philippines GHGi manual.

Total GHG emissions from the Forestry sector stands at 175,203.5 tonnes CO₂e. Whereas, GHG sinks from Forestry is calculated at 1,485,732.76 tonnes CO₂e.

Table 28. GHG Emissions from Forest and Land-use Change, Davao City 2017

District within LGU	Data Source Identifier (Sort Alphabetically)	Emission Type	Type of Data (e.g., Other)	Emission Source	Quantity	Units	CO ₂ Emission Factor	Units	CO ₂ Emissions (tons CO ₂)	GHG Emissions (tons CO ₂ e)	Proportion of Emissions
Davao City	Forest Land Use Plan	Wood and Wood Products Harvesting	Census Average	Fuelwood	2.2	cubic meters	0.74	tons CO ₂ / cubic meter	1.64	1.64	0.00%
				Charcoal	51.4	cubic meters	1.80	tons CO ₂ / cubic meter	92.40	92.40	0.05%
				Construction	29.7	cubic meters	1.10	tons CO ₂ / cubic meter	32.56	32.56	0.02%
		Changes in the Use of the Forestlands	Census Average	Used for Agriculture	12,458.4	hectares	14.03	tons CO ₂ / hectare	174815.29	174815.29	99.78 %
				Left as Barren Areas	18.6	hectares	14.03	tons CO ₂ / hectare	261.56	261.56	0.15%

Source: GHGI 2017, Davao City

Table 29. Total Forestry GHG Removal by source , Davao City 2017

District within LGU	Data Source Identifier (Sort Alphabetically)	Emission Type	Type of Data (e.g., Other)	Emission Source	Quantity	Units	CO ₂ Removal Factor	Units	CO ₂ Removal (tons CO ₂)	GHG Removal (tons CO ₂ e)	Proportion of Emissions
Davao City	Forest Land Use Plan	Remaining Forestland	Other (e.g. Fuel Supplier Totals)	Protection Forest/ Old Growth/Mossy/ Pine/Submarginal Mangrove	4,920.4	hectares	3.44	tons CO ₂ / hectare	16935.56	16935.56	1.14%
				Secondary Growth	13,651.0	hectares	10.49	tons CO ₂ / hectare	143153.49	143153.49	9.64%
				Brushland - for wood	79,188.0	hectares	15.61	tons CO ₂ / hectare	1236393.92	1236393.92	83.22%
				Tree Plantation – S. macrophylla	3,225.0	hectares	11.85	tons CO ₂ / hectare	38224.31	38224.31	2.57%
				Grassland	15,636.0	hectares	3.26	tons CO ₂ / hectare	51025.48	51025.48	3.43%

Source: GHGI 2017, Davao City

Quality control/quality assurance

Data were sourced from the Department of Environment and Natural Resources and referenced in the Forest and Land Use Plan of Davao City.

Uncertainty assessment

Not evaluated.

Further improvements

Data may be underestimated on Forest Emissions. A lot of unmonitored timber harvesting for timber, charcoal making, and other uses go unmonitored.

Also, there have been several urban greening initiatives by private businesses and non-profit organizations in the city for the last few years. A lot of these areas reforested and/or planted with trees may also be considered.

8. Industrial processes and products use (IPPU)

There are 2 ways in generating Greenhouse gas emissions from industrial processes. First, they may be generated and emitted as the byproducts of various non-energy- related industrial activities. Second, they may be emitted due to their use in manufacturing processes or by end- consumers. In the case of byproduct emissions, the emissions are generated by an industrial process itself, and are not directly a result of energy consumed during the process. For example, raw materials can be chemically or physically transformed from one state to another. This transformation can result in the release of greenhouse gases such as carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated greenhouse gases (e.g., HFC-23).³⁶

GHG emissions from IPPU of a cement company in Davao City is at 2,860,448 tonnes CO₂e. Although only one industry was sampled in this baseline, the GHG emission from this category records the highest carbon emission output.

Methodology

The team identified HG intensive industries registered in the City's Business Bureau. A list of possible industries to collaborate were drawn and contacted by the team to provide relevant information related to GHGI.

The selection of industries is based on the IPCC categories of industrial processes: mineral industry, chemical industry. Metal industry, non-energy products from fuels and solvent used, electronics industry, products used as a substitute for ozone-depleting substances, other products, and manufacture use, and others such as pulp and paper and food industry.

Activity data

The City was only able to get the response of an industrial company mainly processing raw materials for cement production.

36 EPA. Industrial Processes and Products Use. At https://www.epa.gov/sites/production/files/2019-04/documents/us-ghg-inventory-2019-chapter-4-industrial-processes_and_product_use.pdf

Table 30. Annual Cement Production of Holcim Philippines, Davao City 2017

District or Barangay - please select from drop-down	Data Source Identifier	Type of Data (e.g. , Others) - please select from drop-down	Industry Type (please select from drop-down)	Operation (please select from drop-down)	Annual Total Production	Units (please select from drop-down)
Davao City	Holcim Philippines	Individual Business Surveys	Mineral Industry	Cement Production - Portland	1,430,224	tons

Source: GHGI 2017, Davao City

Emission factor

The EF values for CO2 were based on IPCC 2006.

GHG emissions for Industrial processes of 1 cement company in Davao City is at 2,860,448 tonnes CO₂e. Although only one industry was sampled in this baseline, the GHG emission from this category records the highest carbon emission source.

Table 31. GHG Emissions from Industrial Processes and Products Use, Davao City 2017

District within LGU	Data Source Identifier (Sort Alphabetically)	Industry Type	Type of Data (e.g. , Other)	Operation	Quantity	Units	CO ₂ Emission Factor	Units	CO ₂ Emissions (tons CO ₂)
Davao City	Holcim Philippines	Mineral Industry	Individual Business Surveys	Cement Production - Portland	1,430,224.0	tons	2.00	tons CO ₂ / ton	2860448.00

Source: GHGI 2017, Davao City

Quality control/quality assurance

Data was provided/self-reported by the Holcim company. As there is no basis for comparison, the team deemed this sufficient baseline for this GHG accounting period.

Uncertainty assessment

Not evaluated

Further improvements

There is a need to disaggregate data from the Business Bureau and for the team to include other local industrial processes based on the recommendation of IPCC for selecting industrial processes for GHG quantification.

VII. Challenges, Scope and Limitations

As Davao City accounts for its GHG emissions for the first time there were a few challenges encountered. Articulating these impediments will contribute to the improvement of the GHGI inventory in the next reporting period.

1. Filtering of data. Some figures such as the specific business line of establishments were not disaggregated according to the required values of the GHG inventory. The team had to use their best judgment and use published reference baselines to extract the data accordingly. There is a need to work with the City Business Bureau to collect a more accurate classification of data that would be useful for the GHGI process and reporting for the succeeding period.
2. Difficulties in securing the total production values of commercial and industrial processes as most businesses would prefer not to divulge such information easily. In the case of electricity consumption, there is a need to work with the Department of Energy to get more meaningful data and disaggregated information.
3. More capacity building for the GHGI team in learning the tools especially in the quantification process and identification of uncertainties per parameter and categories. As part of the learning curve, there were a few difficulties in interpreting information that is not covered in the GHGI User's Manual, the team needs further coaching and mentoring to be able to be more effective in their roles.
4. Partnership and linking with other Government Agencies. In the next reporting period, the quantification of GHG emissions in solid waste and wastewater treatment/discharge needs more preparation on the part of the Davao City TWG Team. A more comprehensive baselining and data collection is needed to be able to secure the required information for GHG emission accounting.

In all areas of concern, it is strategic for the team to work, get support, mentoring and collaboration with the Environmental Management Bureau, Barangay Local Government Units and all other national government agencies. A lot of information has been gathered in these institutions and agencies and it would be a matter of synchronising data collection in the succeeding period to be able to do a more comprehensive GHG Inventory.

VIII. References

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IX. Annex - Davao GHGI Outputs (in Spreadsheets)

Instructions: Spreadsheet for Community-Level Greenhouse Gas (GHG) Inventory Quantification in the Philippines

This GHG Inventory Quantification Support Spreadsheet is a tool created to assist local government units (LGU) in the quantification of greenhouse gas (GHG) emissions at the community-level.

To use this tool, follow the instructions on each tab. Input values required from the user are entered in the yellow cells located on the yellow tabs. Once the activity data and uncertainty estimates have been entered on the yellow tabs, the user should sort the output data on the blue community "GHG" tabs according to the instructions on each tab. The final list of key source categories for the community-level emissions can be found on the green "Summary - Overall" and "Summary by Source" tabs.

Separate worksheets have been developed to record the data for GHG source categories and sources within the community, including emissions outside the LGU geopolitical boundaries resulting from activities inside the LGU geopolitical boundaries. The community sectors include stationary combustion for residential and commercial users, electricity consumption (from scope 2 sources) for residential and commercial users, mobile combustion for road transportation, waste and waste water and agriculture. A summary of the community GHG emissions is provided in a separate worksheet and will be automatically filled in as the user inputs the data into each sector's worksheet.

Tab Key:

Tabs highlighted in blue are GHG emissions calculations for source categories (e.g. purchased electricity)

Tabs highlighted in yellow require user input of activity data

Tabs highlighted in purple are for emission factors and other reference information

Tabs highlighted in green are summary tabs or general user information tabs

Cell Key:

Cells highlighted in grey are static identifiers, transcribed directly from another tab/cell, instructional boxes, or titles and should not be altered

Cells highlighted in yellow should be inputted by the user to calculate GHG emissions and document inventory development and quality management

Cells highlighted in orange *can* be filled in (e.g. with regional/custom factors), but should have default values already input

Cells highlighted in green *can* be altered with empirical data if available.

Cells highlighted in blue contain values or data (e.g. GHG emissions or otherwise) which are automatically calculated based on the information inputted by the user.

InternalControl

General Info		GI		District and Barangay	
GHG Inventory Year		Water-Data-Scope1		Davao City	
Type of Data		Water-Data-Scope3			
2008					
2009					
2010					
2011					
2012					
2013					
2014					
2015					
2016					
2017					
2018					
2019					
2020					
Type of Data		Fuel Type		Units	
Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Biodiesels (International)	kg		
Individual Household Surveys	Cooking/Heating	Blended Diesel Industrial (Philippines)	l		
Other (e.g. Fuel Supplier Totals)	Generator(s)	Blended Diesel Residential/Commercial (Philippines)			
	HVAC	Blended Gasoline Residential/Commercial (Philippines)			
	Lighting	Charcoal (Biomass, International)			
	Other	Diesel (International)			
		Kerosene (International)			
		Motor Gasoline (International)			
		Natural Gas (International)			
		Propane or Liquefied Petroleum Gases (International)			
		Residual Fuel Oil (International)			
		Wood or Wood Waste (Biomass, International)			
Type of Data		Fuel Type		Units	
Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Cooking	Biodiesels (International)			
Individual Business Surveys	Cooking/Heating	Blended Diesel Industrial (Philippines)			
Other (e.g. Fuel Supplier Totals)	Generator(s)	Blended Diesel Residential/Commercial (Philippines)			
	HVAC	Blended Gasoline Residential/Commercial (Philippines)			
	Lighting	Charcoal (Biomass, International)			
	Other	Diesel (International)			
		Kerosene (International)			
		Motor Gasoline (International)			
		Natural Gas (International)			
		Propane or Liquefied Petroleum Gases (International)			
		Residual Fuel Oil (International)			
		Wood or Wood Waste (Biomass, International)			
Type of Data		Application (Using Fuel Consumption-Based Method)		Units	
Fuel Supplier Data	Bus - Diesel	100% Biodiesel	kg		
National or Provincial Census/Statistics	Bus - Ethanol	Aviation Gasoline	l		
Transportation/District Survey Data	Bus - Gasoline	B20 Biodiesel/Diesel			
Other	Heavy Duty Vehicle - Articulated - CNG	CNG			
	Heavy Duty Vehicle - Articulated - Diesel - Year 1960-present	E85 Ethanol/Gasoline			
	Heavy Duty Vehicle - Articulated - Ethanol	Ethanol			
	Heavy Duty Vehicle - Articulated - Gasoline - Year 1985-1986	Gasoline/Petrol			
	Heavy Duty Vehicle - Articulated - Gasoline - Year 1987	Jet Fuel			
	Heavy Duty Vehicle - Articulated - Gasoline - Year 1988-1989	LNG			
	Heavy Duty Vehicle - Articulated - Gasoline - Year 1990-1995	LPG			

Internal Control

Dropdown Lists		District and Barangay
Household Surveys		
National or Provincial Electricity Averages		
Other		
Electric-Commercial Data		Solid Waste-GHG-Landfill
Data Type		
Electricity Utilities Provider		
Business Surveys		
National or Provincial Electricity Averages		
Other		
Electric others		Solid Waste-GHG-Other-ICLEI
Data Type		
Electricity Utilities Provider		
Business Surveys		
National or Provincial Electricity Averages		
Other		
Agriculture-Crops Data		Solid Waste-GHG-Open Burning
Data Type		
Census Averages (e.g. National or Provincial Per Capita consumption)	Application	
Data Directly from Government Agricultural Agency	Rice (Dry Season, Irrigated)	
Sampling Surveys	Rice (Dry Season, Rainfed)	
	Rice (Wet Season, Irrigated)	
	Rice (Wet Season, Rainfed)	
	Crop Residues (tonnes of dry weight)	
	Other Crop Type (Custom Emission Factor)	
	Other Crop Type (Custom Emission Factor)	
Agriculture-Livestock Data		Solid Waste-GHG Calc-IPCC
Data Type	Application	
Census Averages (e.g. National or Provincial Per Capita consumption)	Buffalo	
Data Directly from Government Agricultural Agency	Cattle	
Sampling Surveys	Goat	
	Horse	
	Other (must enter livestock-specific emission factor)	
	Poultry	
	Swine	
Solid Waste-Parameters-IPCC FOD		Solid Waste-GHG_Results-IPCC
Solid Waste-MCF-IPCC FOD		Wastewater-GHG-Scopal
Solid Waste-Activity-IPCC FOD		Wastewater-GHG-Scops3
Solid Waste-Landfill-ICLEI		GHGPs and Conversion Factors
Landfilllocation	Landfilltype	
Inside	Managed - anaerobic	Impact of waste site - % DOCI used in the calculation
Outside	Managed - semiaerobic	1
	Uncategorized	0.5
	Unmanaged - deep	0.6
	Unmanaged - shallow	0.8
		0.4
Solid Waste-Other Methods-ICLEI		Emission Factors
Solid Waste-Open Burning-ICLEI		
Forestry		
Data Type	Emission Source	Units
	Changes in the Use of the Forestlands Used for Agriculture	cubic meters
	Fuelwood	tons
	Charcoal	hectares
	Construction	tons CO2/ton
	Novelties	tons CO2/hectare
	Wood and Wood Products Harvesting	tons CO2/cubic meter
	Left as Barren Areas	tons CO2/hectare

InternalControl

Dropdown Lists		Units		District and Barangay
Removal Source	Land Use Change	hectares	tons CO2/hectare	
Remaining Forestland				
Protection Forest/Old Growth/Mossy/Pine/Submarginal Mangrove	Barren to Forestland			
Secondary Growth	Grassland to Forestland			
Brushland - for wood	Wetlands to Forestland			
Grassland	Settlement to Forestland			
Tree Plantation - S. macrophylla	Cropland to Forestland			
Industrial Processes				
Data Type	Industry Type	Units	tons	tons CO2/ton
Industrial Processes	Mineral Industry			
	Cement Production - Portland	Metal Industry		
	Cement Production - Blended	Iron and Steel Production from Integrated Facilities		
	Lime Production	Iron and Steel Production from Non-Integrated Facilities		
	Glass Production	Chemical Industry		
		Ammonia Production		
		Soda Ash Production		
		Petrochemical and Carbon Black Production - Methanol		
		Petrochemical and Carbon Black Production - Ethylene Chloride Monomer		
		Petrochemical and Carbon Black Production - Ethylene Dichloride and Vinyl Chloride Monomer		
		Petrochemical and Carbon Black Production - Ethylene Oxide		
		Petrochemical and Carbon Black Production - Acrylonitrile		
	Petrochemical and Carbon Black Production - Carbon Black			
	Electronics Industry			
	Integrated Circuit or Semiconductor			
	TFT Flat Panel Display			
	Photovoltaics			
	Heat Transfer Fluid			
	Others			
	Pulp and Paper Industry			
	Food and Beverages Industry			
	Other			

General Information

Name of GHG Inventory Manager:		ENGR. IVAN C. CORTEZ, EnP.
GHG Inventory Manager(s) Contact Information	Organization:	CPDO
	Title:	Officer-in-Charge
	Email:	cpdo.pmed@gmail.com
	Telephone:	(0820) 241-1000 loc.280
Name of Community:		DAVAO CITY
GHG Inventory Year:		2017
Reporting Date:		2019/2/5
Population (year round residents):		1,708,972
Land Area (sq. kilometers):		2,440
Urbanized Area (sq. kilometers)*:		156
Heating Degree Days (18°C base)*:		highest: 34.3 lowest:23.4
Building Gross Floor Area (m²)*	Residential:	
	Commercial:	
	Industrial:	
Name, Status and Adress of Third Party Verifier (if applicable):		
Other Information (e.g. websites of fuller inventory report or emissions reduction program):		
File Date:		
File Number:		
Version Number:		
Work performed by:		
Work reviewed by:		

* Optional reporting data that helps with interpretation of GHG sources

Summary—Overall			
Emission Source	GHG Emissions (tonnes CO ₂ e)	Proportion of Total Emissions	Weighted Uncertainty
Scope 1 Emissions (Net of Forestry and Land Use)			
GHG Emissions from Community-Level Residential Stationary Fuel Use	534040.77	11.34%	0%
GHG Emissions from Community-Level Commercial Stationary Fuel Use	79486.57	1.69%	0%
GHG Emissions from Community Mobile Combustion	1405481.84	29.85%	0%
GHG Emissions from Solid Waste Disposal - IPCC FOD Method*	0.00	0.00%	0%
GHG Emissions from Other Solid Waste Treatment (ICLEI)*	18285.15	0.39%	0%
GHG Emissions from Solid Waste Open Burning (ICLEI)*	49.24	0.00%	0%
GHG Emissions from Wastewater Treatment and Discharge	186067.53	3.95%	0%
GHG Emissions from Community-Level Agriculture (Crops)	12847.80	0.27%	8%
GHG Emissions from Community-Level Agriculture (Livestock)	305171.49	6.48%	6%
GHG Emissions from Solid Waste Disposal - Inside LGU Geopolitical Boundaries (ICLEI)	25.20	0.00%	0
GHG Emissions from Wastewater Treatment and Discharge (Other Sources)	0.00	0.00%	
GHG Emissions from Industrial Processes and Product Use	2860448.00	60.75%	
Scope 1 Emissions/Removal (Forestry and Land Use)			
GHG Emissions from Forestry and Land Use	175203.45	3.72%	
GHG Removal from Sink	-1485732.76	-31.56%	
Total Scope 1 Emissions	4,091,374	86.90%	1%
Scope 2 Emissions			
GHG Emissions from Purchased Electricity at Community-Level Residential Sites	150257.18	3.19%	0%
GHG Emissions from Purchased Electricity at Community-Level Commercial Sites	338965.79	7.20%	10%
GHG Emissions from Purchased Electricity at Community-Level for All Other Sources	127776.50	2.71%	10%
Total Scope 2 Emissions	616,999	13.10%	6%
Scope 3 Emissions			
GHG Emissions from Solid Waste Disposal - Outside LGU Geopolitical Boundaries (ICLEI)	0.00	0.00%	
Total Scope 3 Emissions	4,708,374	100.00%	3%

*Either the **IPCC First Order Decay (FOD)** method *AND/OR* the **ICLEI** method may be used for determining GHG emissions from municipal solid waste disposal. For example, the IPCC FOD method may be used for solid waste disposal at managed sites in conjunction with the ICLEI methods for waste incineration/biological treatment, which are IPCC compliant. The user must however choose only one method for determining GHG emissions from disposal at solid waste disposal sites (SWDS).

The main differences between the IPCC FOD method and the ICLEI method is that the FOD method produces a time-dependent emission profile that better reflects the true pattern of the degradation process over time, whereas the ICLEI method is based on the assumption that all potential CH₄ is released in the year the waste is disposed of. The ICLEI method will give a reasonable annual estimate of actual emissions if the amount and composition of deposited waste have been constant or slowly varying over a period of several decades. If the amount or composition of waste disposed of at SWDS is changing more rapidly over time, however, the ICLEI default method will not provide an accurate trend. For example, if there is a reduction in the amount of carbon deposited at SWDS, the default method will underestimate emissions and overestimate reductions.

It is good practice to use the FOD method, if possible, because it more accurately reflects the emissions trend. The use of the FOD method requires data on current, as well as historic waste quantities, composition and disposal practices for several decades. It is good practice to estimate this historical data, if such data are unavailable, when this is a key source category (see Chapter 7, Methodological Choice and Recalculation) or if there have been significant changes in waste management practices. Inventory agencies (LGUs) are encouraged to obtain data from country-specific or regional research if available.

Data Collection Guidance: Residential Stationary Combustion (Scope 1) Activity Data													
Name of Individual(s) Responsible for Data Input:	Engr. Ivan C. Cortez Loreida Fabro Maria Lourdes Misa	Date of Most Recent Data Entry:	3/1/2017	Quality Control (QC) Checker(s):	Enol John Deocosta Aldeth Manjarit	Corresponding Quality Control (QC) Checklist Filename:	/filename.xls						
LEU-Specific Assumptions and Notes on Methodology													
Assuming that the total Cooking Facility Households follows the consumption pattern as follows:													
1. A 3.5 kg/day of firewood													
2. A 100 L/year of Kerosene													
3. Two (2) tanks of Liquefied Petroleum Gas (LPG) weighing 11 kg/each													
4. Two (2) kgs/ day of Charcoal.													
District or Barangay	Total Population in District or Barangay	Total Number of Residential Households in District/Barangay (enter "N/A" if no survey data)	Number of Households Surveyed (enter "N/A" if no data)	Representative Sample of Household Surveys	Notes								
Davao City	1708972	N/A	N/A	N/A									
%% %% %													
Community-Level Residential Stationary Combustion Emissions Sources													
District or Barangay - Please select from drop-down	Data Source Identifier (e.g. Residential Household Survey, National Census Survey Number)	Type of Data (e.g. Individual Household Survey, National Census Survey)	Average (e.g. select from drop-down)	Application (e.g. cooking, lighting, space heating, water heater)	Fuel Type - please select from drop-down	Annual Total Consumption	Units (e.g. litres, kg, tonnes, m ³) - metric only	Data Uncertainty (see source section in Guidance or GHG Inventory Data Collection Method document for guidance)	Account or File Code Where Data is Stored	Date Transcribed from Survey or Data Sourced from Government/Other Agency	Ownership and Storage Location of Data (e.g. LGU service office, organization)	Corresponding Quality Control (QC) Reference in Applicable Checklist	Basics of Data Uncertainty
Davao City	Participatory Resource Appraisal	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Wood or Wood Waste (Biomass, International)	218,848.525	kg		CPDO (Research and Statistics Division)	2019/5/1	CPDO (Research and Statistics Division)	N/A	The data are limited to the projections of household for the base year and assumptions given by the DENR-EMB.	
Davao City	Participatory Resource Appraisal	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Kerosene (International)	3,074,300	l		CPDO (Research and Statistics Division)	2019/5/1	CPDO (Research and Statistics Division)	N/A	The data are limited to the projections of household for the base year and assumptions given by the DENR-EMB.	
Davao City	Participatory Resource Appraisal	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Propane or Liquefied Petroleum Gases (International)	5,589,075.00	kg		CPDO (Research and Statistics Division)	2019/5/1	CPDO (Research and Statistics Division)	N/A	The data are limited to the projections of household for the base year and assumptions given by the DENR-EMB.	
Davao City	Participatory Resource Appraisal	Census Averages (e.g. National or Provincial Per Capita Consumption)	Cooking	Charcoal (Biomass, International)	32,085,690.00	kg		CPDO (Research and Statistics Division)	2019/5/1	CPDO (Research and Statistics Division)	N/A	The data are limited to the projections of household for the base year and assumptions given by the DENR-EMB.	
Z... Add rows above as necessary													

Data Collection Guidance: Commercial Stationary Combustion (Scope 1) Activity Data													
Name of Individual(s) Responsible for Data Input	Engr. Ivan C. Cortez Loraida Fabro Marina Lourdes Misa	Date of Most Recent Data Entry:	31/12/2017	Quality Control (QC) Checker(s):	Errol John Demostia Alden Mervilut	Corresponding Quality Control (QC) Checklist Filename:	filename.xls						
LGU-Specific Assumptions and Notes on Methodology													
Assumption:													
1. Fuel type used for most generators is Diesel.													
2. Every Generator, 6.81 Operating Hours per year per Davao Light and Power Company data on Power Interruption.													
District or Barangay	Total Population in District or Barangay	Total Number of Registered Businesses in District or Barangay (enter "N/A" if no survey data used)	Number of Businesses Surveyed (enter "N/A" if no data)	Representative Sample of Businesses Surveyed	Notes								
Davao City	1,708,972												
Community-Level Commercial Stationary Combustion Emissions Sources													
District or Barangay - please select from drop-down	Data Source Identifier (e.g. Business Survey Number)	Type of Data (e.g. Individual Business Surveys, National Census Averages, Other) - please select from drop-down	Other (e.g. Fuel Supplier Totals)	Application (e.g. cooking, lighting, generators) - please select from drop-down	Fuel Type (please select from drop-down)	Annual Total Consumption	Units (e.g. litres, Kg, tonnes, m ³) - metric only	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)	Account or File Code Where Data is Stored	Date Transcribed from Survey or Data Sourced from Government/Other Agency	Ownership and Storage Location of Data (e.g. LGU server, government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of Data Uncertainty
Davao City	Davao Light and Power Company	Other (e.g. Fuel Supplier Totals)	Generator(s)	Generator(s)	Diesel (international)	293,518.00	l		Davao Light and Power Company	2017/5/1	Davao Light and Power Company	N/A	The data are limited to the projections of household for the base year and assumptions given by the DENR-EMB.
Davao City	CPDO-RSD	Individual Business Surveys	Cooking	Cooking	Propane or Liquefied Petroleum Gases (international)	#####	kg		CPDO (Research and Statistics Division)	2017/5/1	CPDO (Research and Statistics Division)	N/A	The data are limited to the projections of household for the base year and assumptions given by the DENR-EMB.
Davao City	CPDO-RSD	Individual Business Surveys	Cooking	Cooking	Charcoal (Biomass, international)	20,858,124.00	kg		CPDO (Research and Statistics Division)	2017/5/1	CPDO (Research and Statistics Division)	N/A	The data are limited to the projections of household for the base year and assumptions given by the DENR-EMB.
Z... add rows above as necessary													

Data Collection Guidance: Community-Level Mobile Combustion (Scope 1) Activity Data														
Name of individual(s) Responsible for Data Input:	Engr. Ivan C. Cortez Lovaida Fabro Marie Lourdes Misa	Date of Most Recent Data Entry:	31/12/2017	Quality Control (QC) Checker(s):	Engr. John Demosio Alden Manulat	Corresponding Quality Control (QC) Checklist Filename:	/filename.xls							
LGUSpecific Assumptions and Notes on Methodology														
Assumptions: • Assumed that all vehicles operating within the LGU frequented the fuel service providers listed below • Subtracted diesel consumed for stationary combustion (e.g. for back-up generators) from the total fuel sales data provided by the fuel suppliers, since these fuel suppliers also evinced residential and commercial customers for stationary sources • Assumed that vehicles registered within the LGU are not frequently purchasing fuel from suppliers operating outside of the LGU														
Barangay or District	Population of Barangay or District	Total Number of Registered Vehicles within the District (Government Agency)	Number of Vehicles Captured in Survey Date (enter 'N/A' if no survey data was used)	Representative Sample	Notes									
Davao City	1708972													
Community-Level Mobile Combustion														
District or Barangay (please select from dropdown)	Vehicle Type or Mobile Emission Source Identifier (e.g. annual diesel sales from fuel supplier)	Type of Data (e.g. Transportation Surveys, National Census Averages, Fuel Supplier) - please select from dropdown	Application (Vehicle Type) if Using Distance-based Method - select from dropdown, e.g. bus, diesel, otherwise leave blank	Application if Using Fuel Consumption-based Method (Mobile Fuel Combustion - All Applications) - otherwise leave blank	Annual Distance Travelled (kilometers, if distance-based methodology being used) - otherwise leave blank	Annual Fuel Consumption or Fuel Sold by Fuel Supplier (Litres or Kg) - otherwise leave blank	Amount of Fuel Used for Stationary Combustion Purposes (litres) from Fuel Supplier - otherwise enter 'N/A'	Annual Amount of Fuel Consumed for Mobile Combustion (litres)	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)	Account or File Code Where Data is Stored	Data Transcribed from Survey or Data Sourced from Government/Other Agency	Ownership and Storage Location of Data (e.g. LGU server, Government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of Data Uncertainty
Davao City	Historical Demand of Petroleum Products of Region XI per Product	National or Provincial Census/Statistics		Gasoline/Petrol		197,472,190	N/A							
Davao City	Historical Demand of Petroleum Products of Region XI per Product	National or Provincial Census/Statistics		On-Road Diesel Fuel		353,157,137	N/A							
Davao City	Historical Demand of Petroleum Products of Region XI per Product	National or Provincial Census/Statistics		Residual Fuel Oil (3x 5 and 6)		15,134,501	N/A							
Z... add row above as necessary														

Data Collection Guidance: Commercial Electricity Consumption (Scope 2) Activity Data										
Name of Individual(s) Responsible for Data Input:	Engr. Ivan C. Cortez Loraida Fabro Maria Lourdes Misa	Date of Most Recent Data Entry:	31/12/2017	Quality Control (QC) Checker(s):	Errol John Denosta Aldeth Manulat	Corresponding Quality Control (QC) Checklist Filename:	filename.xls			
LGU-Specific Assumptions and Notes on Methodology										
Assumptions : • Actual Annual Electricity Consumption (kWh) is based on actual monthly consumption. • Type of consumers are based on the total appliance load upon application. • Lower than 20 kW that are not residential are classified under commercial.										
District or Barangay	Total Number of Commercial Institutions in District or Barangay (enter "N/A" if no survey data used)	Number of Businesses Surveyed (enter "N/A" if no data)	Representative Sample of Business Surveys	Notes						
Davao City										
Commercial Electricity Consumption - Community (kWh)										
District or Barangay - please select from drop-down	Data Source Identifier (e.g. Commercial Survey Number or Utility Name and Source Identifier)	Data Type - (e.g. Individual Business Surveys, National Census Averages, Other) - please select from drop-down	Actual Annual Electricity Consumption (kWh)	Estimated Annual Consumption for Emissions Source (enter "N/A" if actual consumption/utility values provided)	Units (e.g. kWh)	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. LGU server, Government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of Data Uncertainty
Davao City	Davao Light and Power Company - Commercial and Industrial	Electricity Utilities Provider	555,817,089.60	N/A	kWh					

Data Collection Guidance: All Other (Scope 2) Activity Data (e.g. MRT, Streetlights, etc.)										
Name of Individual(s) Responsible for Data Input:	Engr. Ivan C. Cortez Loraida Fabro Maria Lourdes Misa	Date of Most Recent Data Entry:	31/12/2017	Quality Control (QC) Checker(s):	Errol John Denosta Albeth Manulat	Corresponding Quality Control (QC) Checklist Filename:	filename.xls			
LGU-Specific Assumptions and Notes on Methodology										
Assumptions :										
• Actual Annual Electricity Consumption (kWh) is based on actual monthly consumption (in DLPC Streetlights).										
District or Barangay										
Davao City										
Other Electricity Consumption Attributable										
Notes										
All Other Electricity Consumption - Community (kWh)										
District or Barangay - please select from drop-down	Data Source Identifier (e.g. Streetlights, MRT line, Utility Name and Source Identifier)	Data Type - (e.g. Individual Business Surveys, National Census Averages, Other) - please select from drop-down	Actual Annual Electricity Consumption (kWh)	Estimated Annual Consumption for Emissions Source (enter "N/A" if actual consumption/utility values provided)	Units (e.g. kWh/household)	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. LGU server, Government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of Data Uncertainty
Davao City	DLPC - Streetlights	Electricity Utilities Provider	13,687,042		kWh					
Davao City	City Engineer's Office	Business Surveys	195,292,658		kWh					

Data Collection Guidance: Agriculture (Crops) Activity Data										
Name of Individual(s) Responsible for Data Input:	Date of Most Recent Data Entry:	31/12/2017	Quality Control (QC) Checker(s):	Errol John Denosta Aldeth E. Manulat	Corresponding Quality Control (QC) Checklist Filename:	filename.xls				
Assumptions : • Rice Straw and others emits 5 MT/hectare • Assumed that all data provided by the City Agriculturist's Office is correct										
District or Barangay	Total Population in District or Barangay	Total Hectares under Crop Production (hectares, ha)	Hectares Represented by Sampling (enter "N/A" if no survey data)	Representative Sample of Hectares Under Agricultural Management	Notes					
Davao City	1708972	102114.66	N/A	N/A						
Community-Level Agriculture Crop Emissions Sources										
District or Barangay - please select from drop-down	Data Source Identifier (e.g. Name of Government Agriculture Agency and Department)	Type of Data (e.g. Agricultural Bureau, Census Averages, Other) - please select from drop-down	Application (e.g. crop type and approach) - please select from drop-down	Total Hectares Under Production (hectares, ha)	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)	Account or File Code Where Data is Stored	Date Transcribed from Survey or Data Sourced from Government/Other Agency	Ownership and Storage Location of Data (e.g. LGU server, Government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
Davao City	City Agri Office	Data Directly from Government Agricultural Agency	Rice (Wet Season, Irrigated)	923		City Agriculturist's Office (Planning Division)	2019/5/1	City Agriculturist's Office (Planning Division)		
Davao City	City Agri Office	Data Directly from Government Agricultural Agency	Rice (Wet Season, Rainfed)	1039		City Agriculturist's Office (Planning Division)	2019/5/1	City Agriculturist's Office (Planning Division)		
Davao City	City Agri Office	Data Directly from Government Agricultural Agency	Rice (Dry Season, Rainfed)	22		City Agriculturist's Office (Planning Division)	2019/5/1	City Agriculturist's Office (Planning Division)		
Davao City	City Agri Office	Data Directly from Government Agricultural Agency	Crop Residues (tonnes of dry weight)	6845		City Agriculturist's Office (Planning Division)	2019/5/1	City Agriculturist's Office (Planning Division)		

Data Collection Guidance: Agriculture (Livestock) Activity Data										
Name of Individual(s) Responsible for Data Input:	Ergr. Ivan C. Cortez Loraida Fabro Maria Lourdes Misa	Date of Most Recent Data Entry:	31/12/2017	Quality Control (QC) Checker(s):	Errol John Denostia Aldeth Manulat	Corresponding Quality Control (QC) Checklist Filename:	filename.xls			
LGU-Specific Assumptions and Notes on Methodology										
Assumptions : • Assumed that all data provided by the City Veterinarian Office is correct										
District or Barangay	Total Population in District or Barangay	Total Livestock (headcount)	Headcount Represented in Survey Data (enter "N/A" if survey data not used)	Representative Sample of Livestock	Notes					
Davao City	1708972	7256821	n/a	N/A						
Community-Level Agriculture Livestock Emissions Sources										
District or Barangay (please select from drop-down)	Data Source Identifier (e.g. Name of Government Agency and Department)	Type of Data (e.g. Government Agricultural Bureau, National Census Averages, Other) - please select from drop-down	Application (e.g. Livestock Type)	Total Headcount	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' for guidance)	Account or File Code Where Data is Stored	Date Transcribed from Survey or Data Sourced from Government/Other Agency	Ownership and Storage Location of Data (e.g. LGU server, Government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
Davao City	CVO	Data Directly from Government Agricultural Agency	Buffalo	38642		City Veterinarian's Office	2019/5/1	City Veterinarian's Office		
Davao City	CVO	Data Directly from Government Agricultural Agency	Cattle	36318		City Veterinarian's Office	2019/5/1	City Veterinarian's Office		
Davao City	CVO	Data Directly from Government Agricultural Agency	Swine	229854		City Veterinarian's Office	2019/5/1	City Veterinarian's Office		
Davao City	CVO	Data Directly from Government Agricultural Agency	Goat	46867		City Veterinarian's Office	2019/5/1	City Veterinarian's Office		
Davao City	CVO	Data Directly from Government Agricultural Agency	Poultry	6905140		City Veterinarian's Office	2019/5/1	City Veterinarian's Office		

Data Collection Guidance: Solid Waste Disposal Parameters (IPCC FOD Method, Scope 1)						
Name of Individual(s) Responsible for Data Input:		Date of Most Recent Data Entry:		Quality Control (QC) Checker(s):	Names...	Corresponding Quality Control (QC) Checklist Filename: <i>filename.xls</i>
LGU-Specific Assumptions and Notes on Methodology						
Assumptions...						
Landfill Solid Waste Disposal Data Entry Parameters (IPCC FOD Method)						
	IPCC default value	User-defined	Reference and comments			
Starting year	1950					
DOC (Degradable organic carbon)	<i>Waste by composition</i>					
(weight fraction, wet basis)	Range	Default	User-defined			
Disposable nappies	0.18-0.32	0.24				
Food waste	0.08-0.20	0.15				
Garden	0.18-0.22	0.2				
Paper	0.36-0.45	0.4				
Sewage sludge	0.04-0.05	0.05				
Textiles	0.20-0.40	0.24				
Wood and straw	0.39-0.46	0.43				
DOCf (fraction of DOC dissimilated)		0.5				
Methane generation rate constant (k)	<i>Climate Zone: Moist and wet tropical (range and default rates shown below)</i>					
(years ⁻¹)	Range	Default	User-defined			
Disposable nappies	0.15-0.2	0.17				
Food waste	0.17-0.7	0.4				
Garden	0.15-0.2	0.17				
Paper	0.06-0.085	0.07				
Sewage sludge	0.17-0.7	0.4				
Textiles	0.06-0.085	0.07				
Wood and straw	0.03-0.05	0.035				
			0			
Industrial waste	0.15-0.2	0.17				
Delay time (months)		6				
Fraction of methane (F) in developed gas		0.5				
Conversion factor, C to CH ₄		1.33				
Oxidation factor (OX)		0				
Parameters for carbon storage						
% paper in industrial waste		0%				
% wood in industrial waste		0%				

Data Collection Guidance: Solid Waste Disposal Methane Correction Factor (MCF) Calculation (IPCC FOD Method)													
Name of Individual(s) Responsible for Data Input:	Names...	Date of Most Recent Data Entry:		Quality Control (QC) Checker(s):	Names...	Corresponding Quality Control (QC) Checklist Filename:	filename.xls						
LGU-Specific Assumptions and Notes on Methodology													
Assumptions...													
Landfill Solid Waste Disposal Data Entry for MCF Calculation (IPCC FOD Method)													
	Unmanaged, shallow	Unmanaged, deep	Managed	Managed, semi-aerobic	Uncategorised	Distribution Check - Total (100%)	References and comments	Calculated Values for MCF - Weighted average MCF for MSW	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
	MCF	MCF	MCF	MCF	MCF								
IPCC default	0.4	0.8	1	0.5	0.6								
User-defined value	0.4	0.8	1	0.5	0.6								
Distribution of Waste by Waste Management Type - Annex A1.1													
User-defined value (Philippines)	0%	0%	0%	0%	0%								
Year	%	%	%	%	%								
0	0%	0%	0%	0%	0%	0%		0.00					
1	0%	0%	0%	0%	0%	0%		0.00					
2	0%	0%	0%	0%	0%	0%		0.00					
3	0%	0%	0%	0%	0%	0%		0.00					
4	0%	0%	0%	0%	0%	0%		0.00					
5	0%	0%	0%	0%	0%	0%		0.00					
6	0%	0%	0%	0%	0%	0%		0.00					
7	0%	0%	0%	0%	0%	0%		0.00					
8	0%	0%	0%	0%	0%	0%		0.00					
9	0%	0%	0%	0%	0%	0%		0.00					
10	0%	0%	0%	0%	0%	0%		0.00					
11	0%	0%	0%	0%	0%	0%		0.00					
12	0%	0%	0%	0%	0%	0%		0.00					
13	0%	0%	0%	0%	0%	0%		0.00					
14	0%	0%	0%	0%	0%	0%		0.00					
15	0%	0%	0%	0%	0%	0%		0.00					
16	0%	0%	0%	0%	0%	0%		0.00					
17	0%	0%	0%	0%	0%	0%		0.00					
18	0%	0%	0%	0%	0%	0%		0.00					
19	0%	0%	0%	0%	0%	0%		0.00					
20	0%	0%	0%	0%	0%	0%		0.00					
21	0%	0%	0%	0%	0%	0%		0.00					
22	0%	0%	0%	0%	0%	0%		0.00					
23	0%	0%	0%	0%	0%	0%		0.00					
24	0%	0%	0%	0%	0%	0%		0.00					
25	0%	0%	0%	0%	0%	0%		0.00					
26	0%	0%	0%	0%	0%	0%		0.00					
27	0%	0%	0%	0%	0%	0%		0.00					
28	0%	0%	0%	0%	0%	0%		0.00					
29	0%	0%	0%	0%	0%	0%		0.00					
30	0%	0%	0%	0%	0%	0%		0.00					
31	0%	0%	0%	0%	0%	0%		0.00					
32	0%	0%	0%	0%	0%	0%		0.00					
33	0%	0%	0%	0%	0%	0%		0.00					
34	0%	0%	0%	0%	0%	0%		0.00					
35	0%	0%	0%	0%	0%	0%		0.00					
36	0%	0%	0%	0%	0%	0%		0.00					
37	0%	0%	0%	0%	0%	0%		0.00					
38	0%	0%	0%	0%	0%	0%		0.00					
39	0%	0%	0%	0%	0%	0%		0.00					
40	0%	0%	0%	0%	0%	0%		0.00					
41	0%	0%	0%	0%	0%	0%		0.00					
42	0%	0%	0%	0%	0%	0%		0.00					
43	0%	0%	0%	0%	0%	0%		0.00					
44	0%	0%	0%	0%	0%	0%		0.00					
45	0%	0%	0%	0%	0%	0%		0.00					
46	0%	0%	0%	0%	0%	0%		0.00					
47	0%	0%	0%	0%	0%	0%		0.00					
48	0%	0%	0%	0%	0%	0%		0.00					
49	0%	0%	0%	0%	0%	0%		0.00					
50	0%	0%	0%	0%	0%	0%		0.00					
51	0%	0%	0%	0%	0%	0%		0.00					
52	0%	0%	0%	0%	0%	0%		0.00					
53	0%	0%	0%	0%	0%	0%		0.00					
54	0%	0%	0%	0%	0%	0%		0.00					
55	0%	0%	0%	0%	0%	0%		0.00					
56	0%	0%	0%	0%	0%	0%		0.00					
57	0%	0%	0%	0%	0%	0%		0.00					
58	0%	0%	0%	0%	0%	0%		0.00					
59	0%	0%	0%	0%	0%	0%		0.00					
60	0%	0%	0%	0%	0%	0%		0.00					
61	0%	0%	0%	0%	0%	0%		0.00					
62	0%	0%	0%	0%	0%	0%		0.00					
63	0%	0%	0%	0%	0%	0%		0.00					
64	0%	0%	0%	0%	0%	0%		0.00					
65	0%	0%	0%	0%	0%	0%		0.00					
66	0%	0%	0%	0%	0%	0%		0.00					
67	0%	0%	0%	0%	0%	0%		0.00					
68	0%	0%	0%	0%	0%	0%		0.00					
69	0%	0%	0%	0%	0%	0%		0.00					
70	0%	0%	0%	0%	0%	0%		0.00					
71	0%	0%	0%	0%	0%	0%		0.00					
72	0%	0%	0%	0%	0%	0%		0.00					
73	0%	0%	0%	0%	0%	0%		0.00					
74	0%	0%	0%	0%	0%	0%		0.00					
75	0%	0%	0%	0%	0%	0%		0.00					
76	0%	0%	0%	0%	0%	0%		0.00					
77	0%	0%	0%	0%	0%	0%		0.00					
78	0%	0%	0%	0%	0%	0%		0.00					
79	0%	0%	0%	0%	0%	0%		0.00					
80	0%	0%	0%	0%	0%	0%		0.00					
81	0%	0%	0%	0%	0%	0%		0.00					
82	0%	0%	0%	0%	0%	0%		0.00					
83	0%	0%	0%	0%	0%	0%		0.00					
84	0%	0%	0%	0%	0%	0%		0.00					
85	0%	0%	0%	0%	0%	0%		0.00					
86	0%	0%	0%	0%	0%	0%		0.00					
87	0%	0%	0%	0%	0%	0%		0.00					
88	0%	0%	0%	0%	0%	0%		0.00					
89	0%	0%	0%	0%	0%	0%		0.00					
90	0%	0%	0%	0%	0%	0%		0.00					

Data Collection Guidance: Solid Waste Disposal (Landfill)																
Name of Individual(s) Responsible for Data Input:	Date of Most Recent Data Entry:	Quality Control (QC) Checker(s):	Errat John Dencata Alamin, Marifelli	Corresponding Quality Control (QC) Checklist Filename:	llemrmas.xls											
LEU-Specific Assumptions and Notes on Methodology																
Assumptions : • Assumed that all data provided by the City Environment and Natural Resources is correct																
General Solid Waste Activity Data																
Data Source Identifier	Total Population of District/Barangay	Waste Per Capita (if Missing Total Solid Waste for QC value (0.19) for the Philippines - user may enter custom factor - enter information does not need to be estimated	Total Solid Waste for District/Barangay (Estimated)	Total Solid Waste (Actual) for District/Barangay - enter a value of zero "0" if total waste is estimated	Fraction of Total Solid Waste Disposed in Solid Waste Disposal Sites - Philippines - user may change to custom value - see row 226 in Emission Factor tab	Amount Sent to Landfills in District/Barangay	Fraction of Total Waste Sent to Specific Landfill	Specific Landfill Type	Location of Landfill Disposal Site (inside or outside of the boundaries of the LEU) - please select from dropdown	Total Solid Waste Sent to Specific Landfill (actual value is known)	Total City Generated Solid Waste Sent to Disposal Site - user must manually link to the appropriate cell below (actual value is known) - landfill (data tab) - tonnes	Data Uncertainty	Account or File Code Where Data is Stored	Ownership and Storage Location of government agency statistics (database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
DAVAO CITY (Collection Area)	Davao City	0.21	306,910.8	-	69%	211,788.5	100%	Managed - anaerobic	Inside	211,788.45	0.50					
DAVAO CITY (Non-collection Area)		0.21	51,792.1		69%	35,736.5	100%	Unmanaged - deep	Inside	35,736.54	0.50					

Specific Landfill Data Identifier (LGU, District, Barangay)	DAVAO CITY (Collection Area)				
Type of Landfill	Managed - anaerobic				
Total Amount of Solid Waste Sent to Above Type of Landfill	211,768.5				
		Waste Composition % - default IPCC values for Southeast Asia may be changed to custom values	Waste Amount (tonnes)	Degradeable Organic Carbon (DOC, %) - default IPCC values may be changed to custom DOCs	Degradeable Organic Carbon (DOC, tonnes)
Waste Types	Paper/Cardboard	12.9%	27318.1	40.0%	10927.3
	Textiles	2.7%	5717.7	24.0%	1372.3
	Food Waste	43.0%	91060.4	15.0%	13659.1
	Wood	9.9%	20965.1	43.0%	9015.0
	Garden/Park	0.0%	0.0	20.0%	0.0
	Nappies/Diapers	0.0%	0.0	24.0%	0.0
	Sewage/Sludge	0.0%	0.0	5.0%	0.0
	Rubber/Leather	0.9%	1905.9	39.0%	743.3
	All other, Inerts (Plastics, Metals, Glass, Ash, and all inter material with a DOC = 0)	30.1%	63742.3	0.0%	0.0
	Total (DOC, tonnes)				35716.9
DOC that Degrades (DOCf)	% DOC that degrades - default	60.0%			
	% DOC that degrades - used in calculation (enter "N/A" if using default value)				
	Type of Landfill Site	Managed - anaerobic			
	Impact of waste site - % DOCf formation default value	100.0%			
	Impact of waste site - % DOCf used in the calculation (default value may be used or custom value may be entered)	100.0%			
	DOCf generated (tonnes C)	21430.12			
Methane Generated	% DOCf that is Methane - default	50.0%			
	% DOCf that is Methane - used in calculation - user may enter custom %DOCf that is methane	50.0%			
	C to CH ₄ conversion factor	1.33			
	CH ₄ Generated (tonnes)	14251.03			

General Data Identifier (LGU, District, Barangay)		DAVAO CITY (Collection Area)			
Type of Landfill		Unmanaged - deep			
Total Amount of Solid Waste Sent to Above Type of Landfill		35,736.5			
		Waste Composition % - default IPCC values for Southeast Asia may be changed to custom values	Waste Amount (tonnes)	Degradeable Organic Carbon (DOC, %) - default IPCC values may be changed to custom DOCs	Degradeable Organic Carbon (DOC, tonnes)
Waste Types	Paper/Cardboard	12.9%	4610.0	40.0%	1844.0
	Textiles	2.7%	964.9	24.0%	231.6
	Food Waste	43.0%	15366.7	15.0%	2305.0
	Wood	9.9%	3537.9	43.0%	1521.3
	Garden/Park	0.0%	0.0	20.0%	0.0
	Nappies/Diapers	0.0%	0.0	24.0%	0.0
	Sewage/Sludge	0.0%	0.0	5.0%	0.0
	Rubber/Leather	0.9%	321.6	39.0%	125.4
	All other, Inerts (Plastics, Metals, Glass, Ash, and all inter material with a DOC = 0)	30.1%	10756.7	0.0%	0.0
	Total (DOC, tonnes)				
DOC that Degrades (DOCf)	% DOC that degrades - default	60.0%			
	% DOC that degrades - used in calculation (enter "N/A" if using default value)				
	Type of Landfill Site	Unmanaged - deep			
	Impact of waste site - % DOCf formation default value	80.0%			
	Impact of waste site - % DOCf used in the calculation (default value may be used or custom value may be entered)	80.0%			
	DOCf generated (tonnes C)	2893.12			
Methane Generated	% DOCf that is Methane - default	50.0%			
	% DOCf that is Methane - used in calculation - user may enter custom %DOCf that is methane	50.0%			
	C to CH₄ conversion factor	1.33			
	CH₄ Generated (tonnes)	1923.92			

Data Collection Guidance: Other Solid Waste Disposal (Composting, Anaerobic Digestion, Other/Unspecified) - Scope 1

Guidance for Other Solid Waste Disposal Data Collection (CILE Method): The GHG inventory team should collect the activity data below from waste collection, processing, and disposal agencies as required or from appropriate government agencies. The data for biological waste (food waste, yard and park waste and sludge) treatment should be provided at the overall LGU level (i.e., it should be aggregated for the entire community). The waste generation rate and population characteristics for the community should be supported by studies and updated annually. For example, if the daytime commuting population into a community's geographical boundaries significantly exceeds the waste generation rate, this should be reflected in the population data for the community. The data for biological waste disposal (e.g., composting or anaerobic digestion facilities) within the geographical boundaries of the community (Scope 1). Furthermore, this tab is to quantify community-level solid waste GHG emissions for solid waste disposed of via open-burning and other/unspecified disposal methods within the LGU's geographical boundaries (Scope 1).

- In general the LGU will be required to provide the following information:
- The disposal method of waste generated within the community (e.g. semi continuous incineration);
 - Quantity of waste disposed;
 - Composition of the waste stream;
 - Waste dry matter content (%) by waste composition (optional, as default data may be used);
 - Waste carbon content (% carbon in dry weight) by waste composition (optional, as default data may be used);
 - Waste fossil carbon content (% fossil carbon) by waste composition (optional, as default data may be used);
 - Type and location of the disposal facilities for all waste originating in the community;
 - Operational details of the disposal facilities including total waste disposed, existence and effectiveness of any methane recovery systems and historic use

The inventory team should determine what type of (if any) waste incineration methods are used and what percentage of waste is diverted to each disposal method (e.g. fluidized bed continuous incineration) by the amount of waste disposed of using that method.

Name of Individual(s) Responsible for Data Input:	Mains...	Date of Most Recent Data Entry:	Quality Control (QC) Checker(s):	Mains...	Corresponding Quality Control (QC) Checklist Filename:	Filename.xls										
LGU-Specific Assumptions and Notes on Methodology																
General Solid Waste Composting (Biological Waste) Activity Data - Aggregated to the LGU (Community) Level																
Data Source Identifier	Total Population	Waste Per Capita (If Estimating Total Solid Waste) - default IPCC value (0.19) for the Philippines - user may enter "NA" if total waste information does not need to be estimated	Total Solid Waste for District/Barangay (Estimated)	Fraction of Total Solid Waste Sent for Composting - default value of 10% for Philippines - must be changed to custom value	Fraction of Total Solid Waste Sent for Anaerobic Digestion Facilities - default value unknown for Philippines - must be changed to custom value	Fraction of Total Solid Waste Sent for Open Burning - default value unknown for Philippines - must be changed to custom value	Fraction of Total Solid Waste Other/Unspecified - default value known for Philippines - must be changed to custom value	Amount of Total Solid Waste Sent to Anaerobic Digestion Facilities - users may enter real/factual data if it is not estimated on the fraction of total waste	Amount of Total Solid Waste Sent to Other/Unspecified - users may enter real/factual data if it is not estimated on the fraction of total waste	Amount of Total Solid Waste Sent to Open Burning - users may enter real/factual data if it is not estimated on the fraction of total waste	Amount of Total Solid Waste Sent to Other/Unspecified - users may enter real/factual data if it is not estimated on the fraction of total waste	Uncertainty of Data (%)	Account of File Code Where Data is Stored	Ownership and Storage Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		inhabitants	tonnes/capita/year	tonnes	%	%	%	tonnes wet weight	tonnes wet weight	tonnes wet weight	tonnes wet weight					
CENRO	1798972	0.21	358,884.1	10.0%	0.0%	2.0%	3.0%	35,888.4	0.0	7,177.7	10,766.5					

Data Collection Guidance: Solid Waste Disposal (Open Burning) (Solid Waste, Scope 1)											
Name of Individual(s) Responsible for Data Input:	Names...	Date of Most Recent Data Entry:	Quality Control (QC) Checker(s):	Names...	Corresponding Quality Control (QC) Checklist Filename:	filename.xls					
LGU-Specific Assumptions and Notes on Methodology:											
Assumption:											
General Solid Waste Open Burning Activity Data - Aggregated to the LGU (Community) Level											
Data Source Identifier	Total Population	Waste Per Capita (If Estimating Total Solid Waste)- default IPCC value (0.19) for the Philippines - user may enter custom factor - enter "N/A" if total waste information does not need to be estimated	Total Solid Waste for District/Barangay (Estimated)	Total Solid Waste (Actual) for District/Barangay - enter a value of zero "0" if total waste is estimated	Fraction of Total Solid Waste Open Burned inside LGU Geopolitical Boundaries - default value of 0% for Philippines - may be changed to custom value	Amount of Total Solid Waste Open Burned - user(s) may enter real/actual data if it is not estimated on the fraction of total waste	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
DAVAO CITY	1708972	0.21	0.0	-	2.00%	7,174.1					
add rows above as necessary...											

Waste Composition for LGU Waste Open Burned								
DAVAO CITY	Waste Type	Waste Composition - IPCC waste composition default values for Southeast Asia - LGU-specific values preferred	Amount Burned (Open Burning)	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		%	tonnes (wet weight)					
	Paper/cardboard	12.9%	925.5					
	Textiles	2.7%	193.7					
	Food waste	43.5%	3,120.7					
	Wood	9.9%	710.2					
	Garden and Park waste	0.0%	0.0					
	Nappies	0.0%	0.0					
	Rubber and Leather	0.9%	64.6					
	Other, inert waste	30.1%	2,159.4					
	Waste Type	Waste Composition - IPCC waste composition default values for Southeast Asia - LGU-specific values preferred	Amount Burned (Open Burning)	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		%	tonnes (wet weight)					
	Paper/cardboard	12.9%	925.5					
	Textiles	2.7%	193.7					
	Food waste	43.5%	3,120.7					
	Wood	9.9%	710.2					
	Garden and Park waste	0.0%	0.0					
	Nappies	0.0%	0.0					
	Rubber and Leather	0.9%	64.6					
	Other, inert waste	30.1%	2,159.4					

Waste Dry Matter Content (%) LGU Waste Open Burned								
DAVAO CITY	Waste Type	Waste Dry Matter Content - IPCC waste composition default values for Southeast Asia - LGU-specific values preferred	Amount Burned (Open Burning)	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		dry matter as % of we weight	tonnes (dry weight)					
	Paper/cardboard	90.0%	832.9					
	Textiles	80.0%	155.0					
	Food waste	40.0%	1,248.3					
	Wood	85.4%	606.5					
	Garden and Park waste	40.0%	0.0					
	Nappies	40.0%	0.0					
	Rubber and Leather	84.0%	54.2					
	Other, inert waste	90.0%	1,943.5					
Waste Carbon Content (% Carbon in Dry Weight) LGU Waste Open Burned								
DAVAO CITY	Waste Type	Waste Carbon Content - IPCC waste composition default values for Southeast Asia - LGU-specific values preferred	Amount Burned (Open Burning)	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		% carbon in dry weight	tonnes carbon					
	Paper/cardboard	46.0%	383.1					
	Textiles	50.0%	77.5					
	Food waste	38.0%	474.4					
	Wood	50.0%	303.3					
	Garden and Park waste	49.0%	0.0					
	Nappies	70.0%	0.0					
	Rubber and Leather	67.0%	36.3					
	Other, inert waste	3.0%	58.3					
Waste Carbon Content (% Carbon in Dry Weight) LGU Waste Open Burned								
DAVAO CITY	Waste Type	Waste Carbon Content - IPCC waste composition default values for Southeast Asia - LGU-specific values preferred	Amount Burned (Open Burning)	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		% carbon in dry weight	tonnes carbon					
	Paper/cardboard	46.0%	383.1					
	Textiles	50.0%	77.5					
	Food waste	38.0%	474.4					
	Wood	50.0%	303.3					
	Garden and Park waste	49.0%	0.0					
	Nappies	70.0%	0.0					
	Rubber and Leather	67.0%	36.3					
	Other, inert waste	3.0%	58.3					

Fossil Carbon Content (% Fossil Carbon) in Carbon of LGU Waste Open Burned								
DAVAO CITY	Waste Type	Waste Fossil Carbon Content - IPCC waste composition default values for Southeast Asia - LGU-specific values preferred	Amount Burned (Open Burning)	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		% fossil carbon in carbon	tonnes dry weight fossil carbon					
	Paper/cardboard	1.0%	3.8					
	Textiles	20.0%	15.5					
	Food waste	0.0%	0.0					
	Wood	0.0%	0.0					
	Garden and Park waste	0.0%	0.0					
	Nappies	10.0%	0.0					
	Rubber and Leather	20.0%	7.3					
	Other, inert waste	100.0%	58.3					
	Waste Type	Waste Fossil Carbon Content - IPCC waste composition default values for Southeast Asia - LGU-specific values preferred	Amount Burned (Open Burning)	Uncertainty of Data (%)	Account or File Code Where Data is Stored	Ownership and Storage Location of Data (e.g. government agency statistics database)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of the Estimate of Data Uncertainty
		% fossil carbon in carbon	tonnes dry weight fossil carbon					
	Paper/cardboard	1.0%	3.8					
	Textiles	20.0%	15.5					
	Food waste	0.0%	0.0					
	Wood	0.0%	0.0					
	Garden and Park waste	0.0%	0.0					
	Nappies	10.0%	0.0					
	Rubber and Leather	20.0%	7.3					
	Other, inert waste	100.0%	58.3					

Overview of Wastewater Management Systems in LGU for Other Waste Sources (e.g. Waste Received from Other LGUs)											
Waste Source (e.g. LGU Name from which Waste Received)	Total Population of Waste Source	Reference Source(s) for Data (e.g. treatment system types/distribution by population)	Notes	CH ₄ Emissions Potential	N ₂ O Emission Potential	Is the system used in the LGU?	% population using the system		Population using the system		Basis of the Estimate of Data Uncertainty
							Yes or No	%	Number	%	
Uncollecte	Septic tanks	dry climate, ground water table lower than latrine, small family (2-5 people)		See legend below							
		dry climate, ground water table lower than latrine, communal									
		wet climate/flush water use, ground water table than latrine									
Collected	River Discharge	regular sediment removal for fertilizer									
		Stagnant oxygen deficient rivers and lakes									
		Rivers, lakes and estuaries									
Collected	Untreated	Stagnant oxygen deficient rivers and lakes									
		River Discharge									
		Rivers, lakes and estuaries									
Collected	Treated	Sewers (closed and under ground)									
		Open Sewers									
		Centralized aerobic well managed									
Collected	Treated	Centralized aerobic not well managed - overloaded									
		Sludge anaerobic treatment in aerobic plant									
		Aerobic shallow ponds									
Collected	Treated	Shallow (less than 2 m)									
		Anaerobic lagoons									
		Anaerobic reactors									
Totals											0%
Sources of GHG emissions											
Possible source of GHG emissions											
Possible source of GHG emissions when poorly designed											
No source of GHG emissions for this category											

Settlement to Forestland	7.81	7.81	
Cropland to Forestland	7.81	7.81	
Conversion factor, C to CO₂		User-defined (unitless)	User-defined (unitless)
	3.67		3.67
Wood Density		Default (tons/cu.m.)	User-defined (tons/cu.m.)
Fuelwood	0.41		0.41
Construction	0.61		0.61

Data Collection Guidance: Forestry Emission Activity Data												
Name of Individual(s) Responsible for Data Input:	Mr. Arnel C. Lido	Date of Most Recent Data Entry:	31/12/2017	Quality Control (QC) Checker(s):	Eral John Demosta Aldeith Manulat	Corresponding Quality Control (QC) Checklist Filename:	filename.xls					
LGU-Specific Assumptions and Notes on Methodology Assumption :												
District or Barangay	Total Population in District or Barangay	Notes										
Davao City	1,708,972											
Forestry Emission Sources												
District or Barangay - please select from drop-down	Data Source Identifier	Type of Data (e.g. , Others) - please select from drop-down	Emission Type	Emission Source (please select from drop-down)	Annual Total Consumption	Units (please select from drop-down)	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)	Account or File Code Where Data is Stored	Date Transcribed from Survey or Data Sourced from Government/ Other Agency	Ownership and Storage Location of Data (e.g. LGU server, government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist	Basis of Data Uncertainty
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Wood and Wood Products Harvesting	Fuelwood	2	cubic meters		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	N/A	
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Wood and Wood Products Harvesting	Charcoal	51	cubic meters		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	N/A	
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Wood and Wood Products Harvesting	Construction	30	cubic meters		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	N/A	
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Changes in the Use of the Forestlands	Used for Agriculture	12,458	hectares		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	N/A	
Davao City	Forest Land Use Plan	Census Averages (e.g. National or Provincial Per Registered Business Consumption)	Changes in the Use of the Forestlands	Left as Barren Areas	19	hectares		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	N/A	

Z... and rows above as necessary

Data Collection Guidance: Forestry Removal Activity Data											
Name of Individual(s) Responsible for Data Input:	Mr. Arnel C. Lido	Date of Most Recent Data Entry:	3/1/2017	Quality Control (QC) Checker(s):	Errol John Demosta Adein Manulat	Corresponding Quality Control (QC) Checklist Filename:	filename.xls	Notes			
LGU-Specific Assumptions and Notes on Methodology											
Assumption:											
District or Barangay	Total Population in District or Barangay										
Davao City	1708972										
Forestry Removal Sources											
District or Barangay - please select from drop-down	Data Source Identifier	Type of Data (e.g., Others) - please select from drop-down	Removal Type (please select from drop-down)	Removal Source (please select from drop-down)	Annual Total Removal	Units (please select from drop-down)	Data Uncertainty (see source section in 'Guidance for GHG Inventory Data Collection and Quality Management' document for guidance)	Account or File Code Where Data is Stored	Date Transcribed from Survey or Data Sourced from Government/Other Agency	Ownership and Storage Location of Data (e.g. LGU server, government office, organization)	Corresponding Quality Control (QC) Field in Applicable Checklist
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Protection Forest/Old Growth/Mossy/Pine/Submarginal Mangrove	4,920	hectares		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Secondary Growth	13,651	hectares		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Brushland - for wood	79,188	hectares		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Tree Plantation - S. macrophylla	3,225	hectares		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	
Davao City	Forest Land Use Plan	Other (e.g. Fuel Supplier Totals)	Remaining Forestland	Grassland	15,636	hectares		City Planning and Development Office (Project Monitoring and Management Division)		City Planning and Development Office (Project Monitoring and Management Division)	
<small>z..._ref notes above as necessary</small>											

PROPOSED CLIMATE CHANGE MITIGATION OPTIONS

**Report based on Davao City Local
Climate Change Workshop
January 30-31, 2020
Malayan College Mindanao (A Mapua School)**

Background

As proposed by the stakeholders during the Davao City Local Climate Change Formulation Workshop, January 30 to 31, 2020 at the Malayan Colleges, Mindanao Campus (A Mapua School). The workshop was organised by the Davao City LGU, Institute for Global Environmental Strategies (IGES) and Malayan Colleges, Mindanao (A Mapua School).

The stakeholder's forum was participated by around 100 participants from Davao City LGU, government agencies such as DENR, DPWH, DA, DOE, and NCIP; private businesses such as the Davao Light and Power Company, academes such as Malayan Colleges Mindanao, Ateneo de Davao University; Civil Society Organisations based in Davao such as Interfacing Development Interventions for Sustainability, Sustainable Davao Movement, Minland Foundation, World Peadr Committee, Philippines Eagle Foundation, Tambayan, Guide Inc., and among others.

The stakeholders agreed to conduct a further review of the proposed options for the finalization of the LCCAP Plan by April 2020. Further details on human resource and financial mechanisms to develop the options in a plan will be part of the discussion.

This report compiles the current initiatives and list of Climate Change mitigation and adaptations options of Davao City LGU, government agencies, private businesses, academe based in Davao City and CSOs.

The mitigation options was categorised based on the priority areas identified in the National Climate Change Action Plan. The National Climate Change Action Plan (NCCAP) outlines the long-term program and strategies for climate change adaptation and mitigation in line with national development plans. Adopted in 2012, the NCCAP was developed through a multi-sectoral and multi-stakeholder approach and covered key climate actions in the strategic priorities are defined along thematic outcomes – food security, water sufficiency, ecosystem and environmental stability, human security, climate smart industries and services, sustainable energy, knowledge and capacity development. The NCCAP is also envisioned as foundational document vis-à-vis the development of national commitments and disclosures such as Nationally Determined Contribution and National Adaptation Plan. Davao City's commitment to developing its Local Climate Action Plan by piloting its GHG Inventory for the first time sets a local precedence in achieving the Philippines' Nationally Determined Contribution to global climate change targets by 2030.

The proposed priority areas also corresponds to key sustainable goal target 13, taking urgent action to combat climate change, and its impacts. These follows along key SDG 13 target areas:

- 13.1 Strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries;
- 13.2 Integrate climate change measures into national policies, strategies, and planning;
- 13.3 Improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning;
- 13.a Implement the commitment undertaken by developed country Parties to the UNFCCC to a goal of mobilizing jointly USD100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation

- actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible; and
- 13.b Promote mechanisms for raising capacities for effective climate change-related planning and management, in LDCs, including focusing on women, youth, local and marginalized communities.

Sustainable Development Goals



Source: UNFCC

A. CURRENT INITIATIVES

Current Initiatives of the local government units, government agencies and civil society organization to ensure food security in Davao City, addressing climate change impacts and as well as achieve sustainable development goals for the city.

FOOD SECURITY

1. Davao City Agriculturist Office and Department of Agriculture

- Introduction and research of climate resilient, drought and flood resistant crops
- Development Irrigation System
- Rainwater Catchment System
- AMIA (Adaptation Mitigation Initiatives in Agriculture)
- Soil management and conservation practices such as SALT (Sloping Agricultural Land Technology)
- Sustainable Rural Development projects – by DENR, DA, and DILG
- Climate Resilient Village in partnership with a private business, developer/company (DCCI)
- Pest and disease surveillance
- Utilization of waste for fertilizer and fuel
- Rice-Fish culture (Palaymanan)
- Organic Agriculture training and support
- Risk transfer schemes
- Credit support services to eligible farmers and entities

2. Flagship Projects

- Maligaya Flatbed Dryer. Used farm by-products like rice hull, corn cobs, or coffee hulls as fuel for heating drying air; allows drying during unfavorable weather conditions, i.e. at night and during typhoons; and allows income generation from custom drying operations.
- Rice Husk Gasifier Engine. Utilizes rice hull biomass as source of energy; sustainable and environment-friendly; can be used for stationary shaft power application including water pumping, power generation, rice milling.
- Maligaya Rice Hull Stove. Inexpensive and easy to fabricate; environment-friendly; practically smokeless; and efficient and economical.
- Floating garden project. Growing vegetables in the perpetually flooded areas.
- Rice Hull Carbonizer. Lightweight, portable, and easy to fabricate; easy to operate and requires less attention; and efficient, environment-friendly, economical and practically smokeless.

3. Department of Education is implementing vegetable gardening in the schools and organic farming.
4. CSO projects on urban containerise gardening.
5. The City Veterinarian's Office steers the development of organic pasture area for livestocks and development of ethno-medicinal garden.

ECOLOGICAL ENVIRONMENTAL STABILITY

1. Green Building Code - LED/Energy saving lamps, ventilation and insulation
2. Rainwater harvesting Ordinance by Davao City LGU
3. Biogas from Livestock Production project by the Department of Agriculture
4. Carbon Sink Forest (Adop-a-site project of DCWD) by the Watershed Management Council, Davao City Water District, DENR-EMB
5. Deployment of Pollution Control Officers (PCOs and Industry) by DENR-EMB
6. Development of Bamboo Industry as alternative to wood by the Department of Trade and Industry
7. Organic Agriculture Economy (Passaged of Ordinance in Davao City) by City Agriculturist Office
8. Recycling and Composting Facilities by the City Environment and Natural Resources Office

CLIMATE SMART INDUSTRIES AND SERVICES

1. Internal policies on climate change
2. Policy advocacy and lobbying on Environmental issues at the local level
3. Conduct of environmental researches contributing to address climate change
4. Conduct of environmental activities such as community-based water management, tree growing and adopt-a-riverbank program
5. Litigation and consultation on environmental issues on watershed, mining and aerial spray

SUSTAINABLE ENERGY

Mainly initiated by the Department of Energy, Davao Light and Power Company, City Government of Davao and Institute for Environmental Strategies (IGES)

1. Consultations/meetings on vulnerability adaptation assessment, CLUP Climate disaster risk assessment mainstreaming; GHG inventory, and formulation of LCCAP.
2. Mix use of energy resources e.g 68% on renewable energy; annual tree planting activities; and public awareness on radio about electrical safety and energy conservation.
3. Rural household electrification
4. Rural renewable energy
5. Introduction of solar panels
6. Implementation of LED lights and solar panels in building and project design

7. Sister City collaboration with Kitakyushu City Japan and Davao City supporting GHGI and LCCAP formulation, coordinated by IGES

WATER SUFFICIENCY

1. Sewerage & Septage Treatment Plant (50% to 60% Fund)
2. Water Supply Facility (level 1 and 2) [Tourism Water Supply Infrastructure Program]
3. Rainwater Harvester for all Department of Education Schools (e.g. 4 cu. m/tank)
4. Installation of Rainwater collection system for all DPWH offices
5. Tree Transplanting 1:200 (for every tree cut; replant 200 trees) by DPWH.

Government Agencies. Department order no. 187 series of 2015 (policy guidelines on water conservation measures)

- Section 2: Water pump shall be turned on at 7:00 am and turned off at 5:30 Pm during weekdays.
- Section 3: All officials and employees shall turn off the faucets in their respective offices and comfort room when not in use. Everyone shall use containers/glasses when brushing their teeth, washing their hands, cleaning room and other related activities.
- Section 4: Plants shall be watered early in the morning before 10:00 am or late in the afternoon at 4:00 pm onwards to minimize evaporation, consequently giving the plants enough water supply for at least 3 days.
- Section 5: Shuttle buses and other service vehicles shall be washed not more that once week, unless there is a pressing need to wash them (e.g vehicle is covered with mud from previous trip). Pails and "tabo" shall be used for cleaning said vehicles instead of hoses, unless the hose used is a high pressure, low volume type.

HUMAN SECURITY

1. Developed a DRRM Plan for Davao City under the coordination of the DRRM Office
2. Final draft of the updated Comprehensive Land Use Plan for Davao City
3. Ongoing barangay profiling and inclusion of GHG related data collection at the community level by CPDO and Barangay Development Council
4. GHG Inventory by CPDO, TWG members and IGES
5. Various health programs by the City Health Office

MITIGATION OPTIONS AND PRIORITY AREAS

There are already a number of initiatives that has been pushed forward to address and mitigate the impacts of climate change. The stakeholders of the Davao City LCCAP Formulation Workshop are proposing for the following priority areas as added GHG mitigation options, adaptation measures, and as overall inputs to the LCCAP planning process.

FOOD SECURITY

What must be done?	What do we need to fulfill/achieve it?	Who will do it?	Mitigation/SDG Targets
Land Conversion Regulation	<ul style="list-style-type: none"> - Protect prime agriculture areas from conversion to other uses - Lobby for limit in allowed conversion to 15% 	Davao City Agriculture; Fisheries Development Plan	GHG emissions reduction SDG 13
Soil management of areas prone to Landslide/Soil Erosion	<ul style="list-style-type: none"> - Introduction of Sloping Agriculture Land Technology - Practice of zero/minimum tillage farming 		Mitigation - reduction of GHG releases from soil and biomass; low carbon SDG 13, 15
	Multi-cropping system		Reduction of synthetic fertilisers and pesticides; low carbon emissions SDG 2, 12, 13, 15
	Regulate mechanised farming		Minimum tillage - reduction of GHG releases from soil, low carbon SDG 13, 15
Go for renewal energy sources	Explore windmill, solar powered pump and irrigation system		Reduction of fossil fuel use; GHG emission reduction; low carbon SDG 13, 7, 11
Water Conservation	Rainwater harvesting and utilisation of small farm reservoir		Conservation/adaptation measure; ensure water sufficiency during disasters and calamities (adaptation and resilience) SDG 6, 13, 15

Bio energy	Process livestock/poultry waste into organic fertiliser; Biogas technology		GHG emissions reduction, 2, 7, 11, 15
Ensure Food sufficiency	Community gardening establishment (household and community)		Resilience building: Reduction of poverty and hunger; food sufficiency, health safety SDG 1, 2, 3, 13
Revisit Convergence Area Development			
Partnership with schools and universities	Research/technology on resilient agricultural technology		SDG13
Adaptive Mitigation Initiatives in Agriculture	Duplicate successful projects		SDG13

ECOLOGICAL ENVIRONMENTAL STABILITY

What must be done?	What do we need to fulfill/achieve it?	Who will do it?	Mitigation/SDG Targets
Greening	Incorporate TREES as infrastructure plan		GHG emissions reduction SDG 13
	Coordinate Tree cutting with LGU (DPWH)	CPDO	Mitigation - reduction of GHG releases from soil and biomass; low carbon SDG 13, 15
	Proper planning for mangrove trees		Reduction of synthetic fertilisers and pesticides; low carbon emissions SDG 2, 12, 13, 15
	Monitoring of parks and open spaces (CENRO, academe, NGO)		Minimum tillage - reduction of GHG releases from soil, low carbon SDG 13, 15
	Cultivate nurseries for endemic trees	Local community, academe, CENRO	Reduction of fossil fuel use; GHG emission reduction; low carbon SDG 13, 7, 11
	Adapt local indigenous knowledge and practices in CCA/DRR		Conservation/adaptation measure; ensure water sufficiency during disasters and calamities (adaptation and resilience) SDG 6, 13, 15
	Include trees in building designs, especially those along busy streets		GHG emissions reduction, 2, 7, 11, 15
	Identify more urban green spaces		Resilience building: Reduction of poverty and hunger; food sufficiency, health safety SDG 1, 2, 3, 13

Hazard Zones/ Reclaim as buffer zones	Transfer communities in hazard zones		SDGs 13
	Strictly implement the zoning ordinance		GHG emissions reduction SDG 13
Improve solid waste management system (RA 9003)	Expand the collection of residuals	CENRO	Mitigation - reduction of GHG releases from soil and biomass; low carbon SDG 13, 15
	Implement RA 9003 at institutional levels e.g. academe		Reduction of synthetic fertilisers and pesticides; low carbon emissions SDG 2, 12, 13, 15
	Fastrack the septage management	DCWD, CEO, CHO	Minimum tillage - reduction of GHG releases from soil, low carbon SDG 13, 15
	Implement a Davao Gulf Management Plan	Network	Reduction of fossil fuel use; GHG emission reduction; low carbon SDG 13, 7, 11
Promote Sustainable Transport (mass transport)	Regulate private vehicle use (including motorcycles)		Conservation/adaptation measure; ensure water sufficiency during disasters and calamities (adaptation and resilience) SDG 6, 13, 15
	Reserve pedestrian only areas (e.g. City Hall)		GHG emissions reduction, 2, 7, 11, 15
	Policy lobbying	NGOs	Resilience building: Reduction of poverty and hunger; food sufficiency, health safety SDG 1, 2, 3, 13
	Identify and declare Marine Protected Areas		SDG

CLIMATE-SMART INDUSTRIES AND SERVICES

What must be done?	What do we need to fulfill/achieve it?	Who will do it?	Mitigation/SDG Targets
Amend Green Building Code	Require permeable pavement		Water conservation/water sufficiency (resilience building) SDG 11
	Rainwater Conservation		SDG6
	Rooftop garden		GHG removal by carbon sink SDG 2, 11, 13
	Build Green Houses		Low carbon SDG 2, 11, 13
Mandatory Materials Recycling Facility for all Barangay Local Government Units	Commercial establishments, institutions/schools, subdivisions	LGU, BLGU, Developers, Homeowners Association, Academe	Low carbon SDG 11
Improve Carbon Sink/Forest	Public land conservation areas scheme	DENR, LGU, Industries	GHG removal SDG 15, 13
	Designate/build urban parts that is accessible to all		GHG removal SDG 15, 11, 13
	Deploy Forest Guards (e.g. Bantay Bukid) for monitoring		Protection and community participation in mitigating/combating climate change impacts SDG 15, 17
Promotion/Incentives for Green Jobs	Enterprise and companies	DTI, DOLE, LGU	Low carbon SDG 1, 8

Review and update emission and effluent standards	More parameters, especially for GHG strict monitoring	FPA, EMB, DA, CS	GHG national level standards SDG 13
	Mandatory GHG monitoring for small to medium scale industries and recycling plants	EMB, LGU	Enabling, LGU action to combat climate change; GHG inventory reporting SDG 11, 9
	Strictly enforce RA 9003; SLF as final disposal method for solid waste	EMB, City ENRO	Low carbon SDG 11
EPR	Zero waste; plastic free packaging	DTI	SDG 11
Establish/require production data reporting		EMB, DTI, LGU, MMT, SMR	SDG17

CLIMATE-SMART INDUSTRIES AND SERVICES

What must be done?	What do we need to fulfill/achieve it?	Who will do it?	Mitigation/SDG Targets
Housing Development	High density/vertical tenement/row house/clustered planning	LGU, DHSUD, Developer, Private Sector, NHA	Low Carbon SDG 11
Quarrying Industry	Amendment/review mining ordinance	LGU, CENRO, CMRB, DENR, CEO, Operators	SDG 13, 15
	Capacity threshold study		
	Enforcement of low impact operation		

KNOWLEDGE AND CAPACITY DEVELOPMENT

What must be done?	Who will do it?	Mitigation/SDG Targets
Intensify research and data availability	Academic Institutions (USEP, AdDU, Malayan, UM, etc.), DOST, DENR, CPDO, IDIS	
Intensify capacity building and knowledge sharing among the Barangays in Davao City	DILG, LGU, ABC, CSOs	Understanding climate risks and mitigating measure among constituencies SDG 13
Intensify climate change discourse through fora, symposia, and other avenues for dialogues	NGAs, LGAs, and CSOs	Understanding climate risks and mitigating measure among constituencies SDG 13, 17
Engage youth in climate change issues	DepEd, LGU, CSOs, SK, Youth Organizations	Understanding climate risks and mitigating measure among constituencies SDG 13, 17
Develop IEC materials that are reader-friendly	LGU (CIO) and CSOs	Understanding climate risks and mitigating measure among constituencies SDG 13
Engage and utilize multi-media in campaigning to address climate change issues	LGU and CSOs	Understanding climate risks and mitigating measure among constituencies SDG 13

SUSTAINABLE ENERGY

What must be done?	What do we need to fulfil it?	Who will do it?	Mitigation/SDG Targets
Mini Hydropower supply for off-grid and forested areas	Conduct studies in collaboration with agencies	Collaboration of related government agencies, NGOs and Its	Investments for GHG emissions reduction, low carbon SDG 13, 11, 7
Vehicle conversion: use of alternative fuels	Conduct studies with government agencies	Collaboration with relevant government agencies	Investments and technology innovation for GHG emissions reduction SDG 11, 13, 7
Upgrade to biodiesel fuels	Conduct Feasibility Studies	Department of Energy	Investments for GHG emissions reduction, low carbon SDG 7, 13
Promote Euro IV Fuels	Information Education Communication Campaigns on Liquid fuels conservation	Department of Environment and Natural Resources	Investments and technology to reduce GHG emissions SDG 7, 13

WATER SUFFICIENCY

What Needs to be done	What do we need to fulfil it?	Mitigation/SDG Targets
a. Integrated Water Resource Management	Integrated Watershed mgt program	Mainly GHG removal, by carbon sink forest protection, adaptation and resilience building
	Watershed rehabilitation project	SDG 17, 15
	Forest & Biodiversity protection project (forest guardians & foot patrolling)	SDG 15
	Riverbank rehabilitation conservation projects	SDG 15
	Environmental monitoring (rivers)	SDG 15
	Sustainable upland farming & backyard gardening	SDG 2, 15
	Capacity buildings & IECs	
	Adopt-A-Site Project (Tree planting and parenting w/ partner PO's/Agencies)	SDG 15, 13
2. Water safety plan (from source to customer)		SDG 6
3. Water sanitation & hygiene		SDG 6
4. PUSH UP (Public Utility Sanitation & Health Upgraded Program)		
5. Tubig(water) Ambassadors		SDG 17
6. Water Statistics Monitoring		SDG 7
7. Septage Management Program		SDG 13, 11
8. Rain water Harvesting Campaign		SDG 15, 13, 11
9. Ground Water Study		SDG 7

10. Tanugan Surface Water Development Plan		SDG 17
11. Water & Sanitation (Level 1 & 2) Committee	Inventory of levels 1 & 2	SDG 3, 6
	Proposed water system for funding	SDG 7
12. Strengthen Bawasa	Brgy. Water & sanitation	SDG 7
13. Adopt-A-Tree	Yearly tree planting activity in ancestral domain areas of Davao City (Watershed Areas)	SDG 15
14. Tamugan riverbank (malibago) planting and growing		SDG 15
15. River water quality monitoring		SDG 15
16. Biodiversity monitoring (PTW)		SDG 15
17. Illegal logging activities and cleaning tamugan river & tributaries monitoring		SDG 15
18. Monitoring natural calamities and tree planting % IDIS	Massive tree planting in PTW	SDG15
	Declare Panigan-Tamugan as organic zone	SDG15
	Identify and monitor the main water run-off for the hills of PTW	SDG15
	Develop eco-friendly livelihood for upland charcoal makers (to prevent charcoal making)	SDG15
	DPWH should coordinate w/ LGU's & other agencies before doing tree cutting & slope benching along riverbanks and steep slope	SDG 15, 17
19. Politicians should also consider the environmental impacts of the infrastructure projects to propose.	City Council should immediately act in the Draft MOA and septage management (naay ID and potential septage site and DCWD)	SDG 11SDG 6

	Protect the natural surface water sources for the future water needs in Davao City. (ie for Apo Agua Facilities)	SDG 6, 15, 13
	No chemical based "parties" or activities that contaminated rivers/watershed should not be allowed	SDG 6, 15, 14
	No swimming pool resorts in the watershed	SDG 6,15
	Massive tree planting in all Davao City water shed especially in PTW.	SDG 6, 15,16
	Individual efforts to change to eco-friendly lifestyle.	SDG 13

HUMAN SECURITY

What Needs to be done	What do we need to fulfil it?	Mitigation	SDG Targets
Barangay Profiling	Monitoring and enforcement	Improvement of GHG inventory and reporting	SDG13
Life Cycle Approach			SDG9
Raising Awareness and education on climate change			SDG13
Urban Forestry Landscape Programs		GHG removal	SDG15
Retrofitting of public buildings (Green Building Code)		Low carbon	SDG11

Annex A

List of organisations, Davao City LGU, and government agencies who participated in the 2 day workshop, January 30-31, 2020 at the Malayan Colleges Mindanao, Davao City

Government

1. Davao City- City Planning and Development Office
2. Davao City Council, Davao LGU
3. Davao City Water District
4. Sanggunian Kabataan (Youth Council)
5. City Disaster Risk Reduction and Management Office (CDRRMO)
6. Environment and Natural Resources Office (CENRO)
7. Department of Environment and Natural Resources - Environment Management Bureau (DENR-EMB)
8. City Councillor of 1st District - City Council
9. Department of Energy (DOE Mindanao)
10. Department of Agriculture (DA) Region XI
11. City Transportation and Traffic Management Office (CTTMO)
12. City Agriculturist Office, Davao City
13. Department of education Region XI (DepED)
14. National Commission on Indigenous Peoples (NCIP Region XI)
15. Department of Public Works and Highways (DPWH)
16. City Veterinarians Office

Civil Society GroupCity s

17. Interface Development Interventions for Sustainability
18. Guide Inc.
19. FSD
20. Mindanao Land Foundation
21. San Lorenzo Foundation
22. World Peace Committee
23. SALIGAN (Alternative Law Group)

Academe

24. Malayan Colleges Mindanao
25. Ateneo de Davao University

26. Ecoteneo - Ateneo de Davao University
27. Philippine eagle Foundation
28. SEA - Ateneo de Davao University
29. Tambayan (Child and Youth)
30. Masipag (CSP Organic Agriculture Practitioners and Advocates)
31. University of the Philippines School of Law (Usep - SoL)

Private Businesses/Companies

32. Davao Light and Power Company (DLPC)

Community groups/volunteers

33. Bantay Bukid (Forest Watch) - Community

International Partners/Guests

34. Institute for Global Environmental Strategies
35. APLA

LUMINAIRE REQUIREMENTS		60W	80W	110W	210W
Correlated Color Temperature (CCT)	3000K (Warm White)				
Color Rendering Index (CRI)	Luminaires shall have a minimum CRI of 70.				
Minimum Luminaire Efficacy	Minimum 105 lm/W for Warm White				
Operating Environment	Luminaire shall be able to operate normally in temperatures from -20° C and 50° C.				
Cooling System	Shall consist of a heat sink with no fans, pumps, or liquids, and shall be resistant to debris buildup that does not degrade heat dissipation performance.				
Housing	Shall be primarily constructed of die cast aluminum, A380. Finish shall be gray in color, powder coated and rust resistant. Driver must be mounted internally and be replaceable. Driver must be accessible without tools. All screws shall be stainless steel. Captive screws are needed on any components that require maintenance after installation. No parts shall be constructed of polycarbonate unless it is UV stabilized (lens discoloration shall be considered a failure under warranty).				
Ingress Protection	Shall be rated at a minimum of IP65 (both optical and gear compartment)				
Wind Velocity Resistance	At least 180kph				
Luminaire Classification	Full Cutoff. A luminaire light distribution where zero candela intensity occurs at or above an angle of 90° above nadir.				
PE Cell Receptacle	NA				
Luminaire Protector	Hinged Tempered Glass or Transparent weather resistant grade polycarbonate optics				
Mounting Arm	Luminaires shall mount on 1" 1/2" O.D. pipe with no more than four bolts and two piece clamp.				
Tilting feature	Can be tilted up to 15 degrees				
Vibration Protection	Meets 3G vibration per ANSI C136.31				
Impact Protection	IK08				
Luminaire and LED Module Lifetime	The luminaire shall have a minimum rated lifetime of at least L80B10 = 100,000 hours The supplier shall provide the technical specifications of the luminaire (which are based on state-of-the-art measurement methods including, where available, harmonized European standards				
Equipment Identification	Serialized/Barcoded. Shows wattage and current ratings.				
Dimension	Supplier to provide				
Weight	Supplier to provide				
POWER SUPPLY/DRIVER REQUIREMENTS					
Power Input	120-277 Volts AC, 60Hz				
Power Factor	Power factor at full load ≥ 0.90				
Electrical Protection	Shall have Class II electrical Protection				
Surge Protection	Up to 10KV				
Operating Temperature	Power Supply shall operate between -20° C and 50° C.				
Lifetime of Driver	The failure rate of the driver shall be lower than 0.1 % per 1,000 hours. Failure after 100,000 hours shall be lower than 10 %. The supplier shall provide the technical specifications of the control gear (based on recognized state-of-the-art measurement methods including, where available, harmonized European standards)				
Frequency	Output operating frequency must be ≥ 120 Hz (to avoid visible flicker) and input operating frequency of 60 Hz.				
WARRANTY					
Warranty period	A warranty must be provided for the full replacement of the luminaire due to any failure within a minimum of five (5) years.				
Luminaire lumen output	The luminaire shall maintain 80% of its initial lumen output within the warranty period. Full replacement of the luminaire if the lumen instrument reading is below 80%.				
Driver maintenance	The warranty shall provide for the repair or replacement of defective electrical parts (including light source and power supplies/drivers) for a minimum of five (5) years from the date of installation.				
Spare parts availability	The availability of spare parts shall be guaranteed for a period of (10) ten years. Concerning reparability, the light source (lamp or LED module) and auxiliaries must be easily accessible and replaceable on site (i.e. at luminaire mounting height). Repair shall be accomplishable with standard, widely accessible tools.				
Replacement of defective batch	Complete replacement of batches of luminaires in case more than 10 % of the units in the batch are defective after 1000 hours of utilization or 83 days				

照明器具の要件		60W	80W	110W	210W
相関色温度 (CCT)	3000K (温白色)				
演色評価数 (CRI)	最低CRI値は70であること				
照明器具の最低エネルギー効率	温白色で最低105 lm/W				
使用環境	-20℃～50℃で正常に使用できること				
冷却システム	放熱板で構成されていて、ファン、ポンプ、液体を含まないもの、かつ、塵等の堆積に強く、熱放散性能を劣化させないもの				
ハウジング	主としてアルミダイキャストA380製であること。仕上がり色はグレー、粉体塗装仕上げ、防錆処理済み。駆動部は内部に取り付けてあり、交換可能であること。駆動部には工具なしでアクセスできること。ネジ類は全てステンレス製。設置後のメンテナンスが必要となる部品には全て拘束ネジを使用すること。部品の材質については、紫外線安定化処理が施されていないポリカーボネイトは、一切使わないこと（レンズの変色は保証内）。				
防塵防水性能	最低でもIP65クラスであること（光学部品、ギア部品とも）				
風速抵抗	最低180kph				
照明器具分類	フルカットオフタイプ。天底角が90℃以上で、光度が0カンデラの地点において配光あり				
PEセルレセプタクル	なし				
照明器具保護器具	蝶番付きの強化ガラス、または透明の耐候性クラスのポリカーボネイトレンズ				
設置アーム	外径1インチ半のパイプに4個以下のボルトと2個のクランプで設置する。				
傾斜仕様	15度まで傾斜可				
振動保護	ANSI規格C136.31で3Gの振動に耐える				
衝撃保護	IK08				
照明器具およびLEDモジュールの寿命	最低でもL80B10クラス、すなわち10万時間の寿命であること。照明器具の技術仕様書（最新の計測方式に基いており、必要があればヨーロッパの基準に適合しているもの）がメーカーから提供されていること				
機器の識別	シリアルナンバー/バーコード付き。定格電力値、定格電流値が表示されている。				
寸法	メーカーが提供				
重量	メーカーが提供				
電源/駆動部の要件					
入力電源	交流120-277 V, 60Hz				
力率	全負荷での力率 0.90以上				
電氣的保護	クラス2の電氣的保護レベル				
サージ保護	10KVまで				
使用温度	電源は -20℃～50℃の範囲で使用可能				
駆動部の寿命	駆動部の故障率は1000時間あたり0.1%未満、10万時間を超えた後の故障率は10%未満とする。コントロールギアの技術仕様書（承認済みの最新計測方式に基いており、必要があればヨーロッパの基準に適合しているもの）がメーカーから提供されていること。				
周波数	出力動作周波数は120 Hz以上（視認性のちらつきを避けるため）、入力動作周波数は60 Hz				
保証					
保証期間	最低5年以内に起こった故障については、照明器具の一括交換を保証する。				
照明器具ルーメン出力	初期ルーメン出力の80%を保証期間内において維持すること。ルーメン計測値が80%を下回る場合は照明器具の一括交換を行う。				
駆動部のメンテナンス	電気部品不良（光源、電源/駆動部を含む）については、設置日から最低5年間、その修繕および交換は保証範囲内とする。				
スベア部品の調達	スベア部品の調達は10年間保証されること。修繕の可否については、光源（電球またはLEDモジュール）および付属部品は現地調達可能で、照明器具を設置した状態で（つまり設置高さのまま）交換できること。標準的で入手しやすい工具で修繕が可能であること。				
不良バッチ製品の交換	同一バッチの照明器具について、1000時間または83日間使用した後の故障率が10%を超える場合、当該バッチの製品はすべて交換すること。				

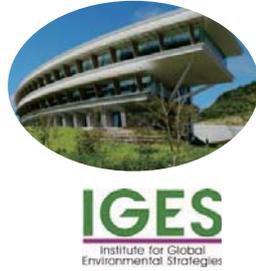
		DHOWA NIINUMA EVALUATION				REMARKS	Recommendation
		160W	80W	60W	45W		
Model	NEW					PASSED	
Wattage	DLPC	210W	110W	80W	60W	ACCEPTABLE	
	Sample	160W	80W	60W	45W		
Lumen Package	DLPC	22050	11550	8400	6300	LESSER BUT ACCEPTABLE	
	Sample	21920	10960	8220	6165		
LED Chip Brand	No established standard yet					PASSED	
	Sample	Lumileds					
LED Nodes (qty)	DLPC	>50 nodes	>30 nodes	>20 nodes	>15 nodes	PASSED	
	Sample	120	54	36	36		
Efficacy (Lumens/Watt)	DLPC Min Required: 105 lumens/watt					PASSED (Better)	
	Sample	137	137	137	137		
Actual Wattage Consumption (Watts)	Should not exceed 5Watts of rated wattage (165W,85W,65W,50W)					PASSED	
	Sample	157.9W	83W	57.8W	41.5W		
Surge Protection	Should have 10kV SPD					PASSED Except 80W	All wattage shall comply.
	Sample	20kV	None	20kV	20kV		
Temperature °C	Should not exceed 85 Degrees C					PASSED	
	Sample	-	38 deg	-	-		
Ingress Protection	Should be IP66 rated					PASSED	
	Sample	IP66	IP66	IP66	IP66		
Body Alloy	DLPC	A380				PASSED (Better)	
	Sample	ADC12					
Average Illuminance (Lux)	No average illuminance standard					PASSED (Better)	
	Sample	36.74	15.51	14.09	11.36		
Uniformity	No uniformity standard					PASSED	
	Sample	0.14	0.13	0.21	0.26		
Mounting Bracket Diameter	Should be 42mm inside diameter					Spigot is too big to fit for our existing bracket.	Ask Supplier to change the spigot to fit to 1 1/2" bracket diameter. Preferred diameter is 42mm
	Sample						
		67mm	67mm	54mm	54mm		
Mounting Bracket Bolts	At least 2 bolts (1 inch length) with lock nut					2 bolts without lock nut	Require lock nut
	Sample						
		1in	1in	1in	1in		

Conclusion Models passed but with some minor revisions.

JCM Model Project for LED Light Project in Davao City

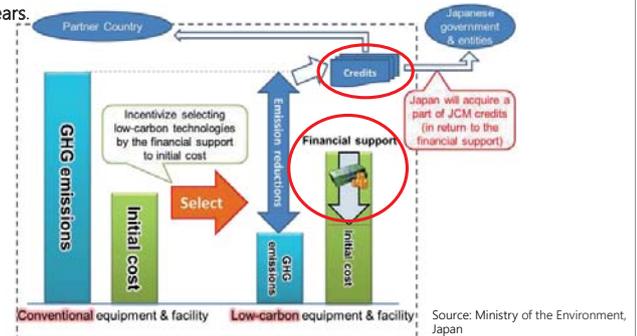
January 31st, 2020

Shiko Hayashi
Programme Director, Kitakyushu Urban Centre



Financing Programme for JCM Model Project

- Scope of the financing: Facilities, equipment, vehicles, etc. which **reduce CO₂ from fossil fuel combustion** as well as **construction cost** for installing those facilities, etc.
- Eligible projects: Starting installation after the adoption of the project and finishing installation **within three years**.



Source: Ministry of the Environment, Japan

Project to realize low carbon society in Davao City through a support for a development of Local Climate Change Action Plan



Support for a development of **Local Climate Change Action Plan** of Davao City

- A development of GHG inventory (supported by IGES)
- A development of mitigation measures (supported by Kitakyushu City and IGES)
- A development of adaptation measures (supported by Ateneo De Davao Uni.)

An implementation of concrete mitigation measures

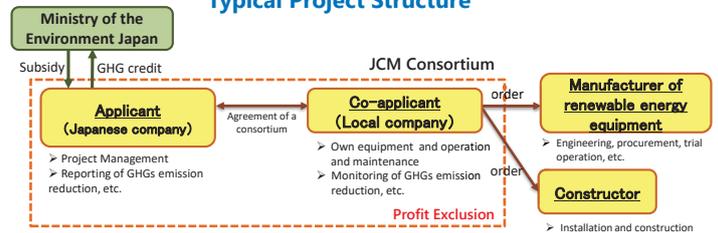
- Study on a feasibility of low-carbon project (for JCM Model Project)
- Feasibility study on other low-carbon projects (renewable energy and energy saving projects)
 - Coordination with related-stakeholders for an implementation, technical study, evaluation of the amount of CO₂ reduction, etc.
 - Supporting for a preparation of applying JCM Model Project

Study on possible application of JCM Model Project

Components will be checked for a feasibility study on low-carbon projects :

- Forming an **international consortium** including both a owner and user of the equipment, etc.
- Coordination on a **timing and condition** of a procurement of a low-carbon project in Davao City with related organizations, etc.
- Coordination with **manufacturers** of renewable energy equipment as well as **constructors**
- **Selection of equipment**, calculate the amount CO₂ reduction, support for a preparation to apply for JCM Model Project

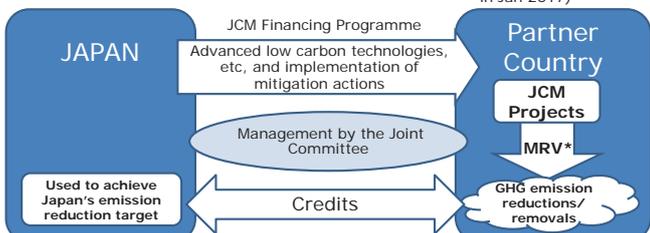
Typical Project Structure



Basic Concept of Joint Crediting Mechanism (JCM)

- Facilitating diffusion of **leading low carbon technologies, products, systems, services, and infrastructure** as well as implementation of mitigation actions of partner countries.
- Evaluating contributions from Japan to **GHG emission reductions or removals in a quantitative manner** by MRV.
- Contributing to achieve Japan's emission reduction target of the UNFCCC by facilitating global actions for GHG emission reductions.

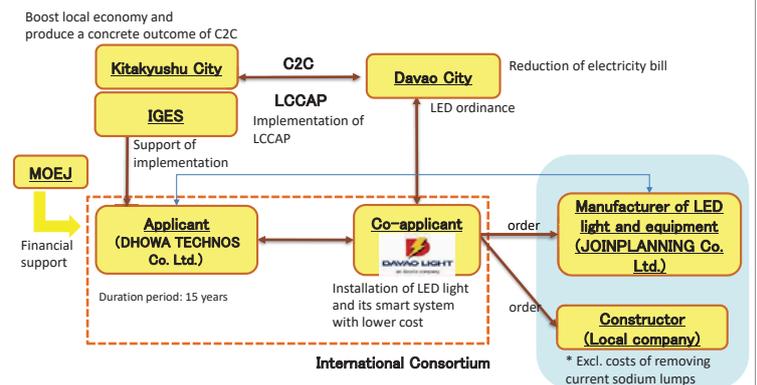
17 Countries (signed with the Philippines in Jan 2017)



*measurement, reporting and verification

Source: Ministry of the Environment, Japan

Possible Project Structure



* Excl. costs of removing current sodium lamps

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Benefits and Responsibilities of Co-applicant under JCM Model Project

Benefits:

- Local partner can buy leading low-carbon technologies with a price reflecting the JCM subsidy
 - expecting to reduce the LED price by XXX

Burdens/responsibilities:

- A limited tendering contract is a requirement
 - A contract for 3 years is preferred.
 - Limited tendering is required in order to justify the condition of JCM Model Project which is the project cannot be implemented without the JCM subsidy.
- Submit the following documents for application
 - A document explaining a payback period or return of investment (with and without the JCM subsidy)
 - Financial report for the latest 3 years (Balance Sheet (BS), Income Statement (PL), Cash Flow Statement)
- Monitoring GHG emission reduction over the legal durable years as stipulated by the Japanese law (LED products: 10 years)
- Accept an inspection by JCM Model project secretariat (randomly selected by GEC)

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Some conditions for JCM Model Project

- Finance rate will be determined based on the number of already selected JCM Model Projects using a similar technology in each country.
- Regardless of the finance rate, selected entities in JCM Model Project are expected to deliver at least half of JCM credits issued to Government of Japan.

Number of already selected project(s) using a similar technology in each partner country	Percentage of financial support
None (0)	Up to 50%
Up to 3 (1 - 3)	Up to 40%
More than 3 (>3)	Up to 30%

Cost effectiveness (JPY/t-CO₂e)

- Dividing "the amount of proposed subsidy" by "the accumulated emission reduction" achieved during "the legal durable years" (under Japanese tax law).
- Below 4,000 JPY/t-CO₂e**

$$\text{Cost effectiveness (JPY/t-CO}_2\text{e)} = \frac{\text{Total initial cost} - \text{Amount of subsidy}}{\text{Reduction for annual operation cost}}$$

Payback period (year)

- Payback (or Return of Investment) period of should be more than 3 years with the financial support.

Source: Ministry of the Environment, Japan

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Schedule for Applying JCM Model Project

* The schedule is followed to Japanese fiscal year (April - March)
* The open call process will be through a year (Apr ~ Nov).

1st year (FY2020)

Timeline: Apr 6th (Open Call for Proposals) - May 14th (Deadline for Proposals) - Document Review and Interview - Preliminary Selection Announcement (Late Jun) - Application for Contract of Financial Support (within 90 days) - Notice of Contract of Financial Support (Late Sep) - Midterm Inspection (document review & on-site inspection) (Feb - Mar) - Submission of End-of-year report (by Apr 10th) - Disbursement of Financial Support

2nd ~ 3rd year (FY2021, FY2022)

Timeline: Construction/Installation Continues (2 to 3 years projects) - Midterm Inspection (document review & on-site inspection) (Feb - Mar) - Submission of End-of-year report (by Apr 10th) - **Contracts signed with Japanese application, manufacturers, local constructor, etc.** (2021) - Completion of the installation (End of Jan) - Submission of completion report (by Feb 26) - Final Inspection - Disbursement of Financial Support (Feb - Mar) - (project completion)

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Calculation of GHG emission reduction

$ER_p = RE_p - PE_p$

ER_p : Emissions reduction during the period p (tCO₂/p)
 RE_p : Reference emissions during the period p (tCO₂/p)
 PE_p : Project emissions during the period p (tCO₂/p)

Criterion	Description
Criterion 1	The project installs LED street lighting system utilizing wireless network control, which is connected to an electricity grid system.
Criterion 2	All lighting equipment in one lighting system has the same specifications.
Criterion 3	Wireless network technology enables controlling of the volume of lighting.

$$RE_p = \sum_i P_i \times (\eta_{PJ,i} \div \eta_{RE}) \times PO_{i,p} \times EF_{grid} \times 10^{-6}$$

RE_p : Reference emissions during the period p (tCO₂/p)
 P_i : Rated power consumption of a lighting equipment used in the project lighting system i (W)
 $\eta_{PJ,i}$: Luminaire efficiency of a lighting equipment used in the project lighting system i (lm/W) 140
 η_{RE} : Luminaire efficiency of the reference lighting system (lm/W) 62 (default)
 $PO_{i,p}$: Total operating hours of project lighting system i during the period p (hrs/p) 4380 hrs/year
 EF_{grid} : Grid emission factor of Mindanao grid (tCO₂/MWh) 0.286
 i : Identification number of the lighting system

$PE_p = \sum_i PEC_{i,p} \times EF_{grid} \times 10^{-6}$

PE_p : Project emissions during the period p (tCO₂/p)
 $PEC_{i,p}$: Total amount of electricity consumed in the project lighting system i during the period p (Wh/p)
 EF_{grid} : Grid emission factor of Mindanao grid (tCO₂/MWh) 0.286
 i : Identification number of the lighting system

GHG emission reduction: 2,193.26 t-CO₂/year
Total GHG emission reduction (10 years): 21,932.6 t-CO₂

Source: <https://www.jcm.go.jp/hk-jp/methodologies/34>

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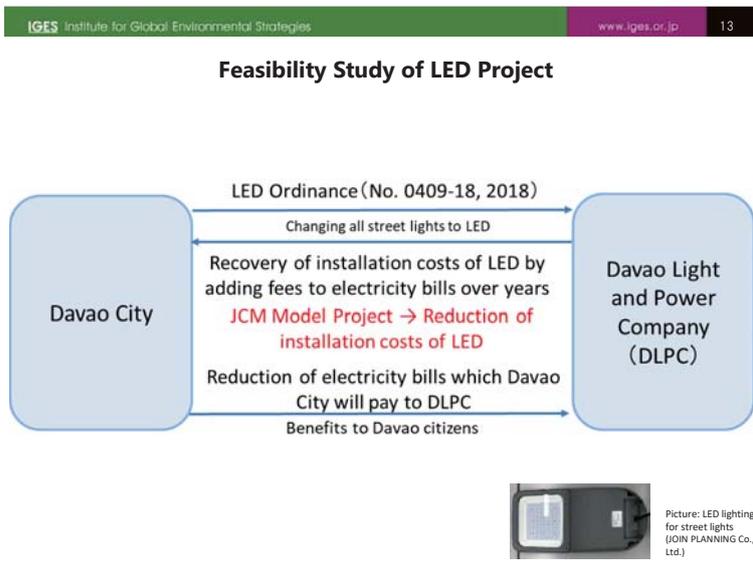
Documents to be submitted for JCM Model Project

- Form No.1 Application Form
- Form No.2 Declaration by Representative Participant
- Form No.3a Project Implementation Plan
 - * Supporting documents must be included according to the Checklist (Form No. 6).
- Form No.3b Project Idea Note for the JCM Model Project
 - * Without prior notice to a representative participant, this document may be shared with government officials of a partner country where a project will be implemented. Also, we may forward questions from the government officials and request for the answers.
- Form No.4 Budget (including supporting documents, such as quotations, of the budget)
- Company information (such as company brochure) and certificate of incorporation of both representative participant and partner participant(s)
- Financial statement of both representative participant and partner participant(s) (audited, recent 3 consecutive years)
- International consortium agreement
 - Draft International consortium agreement and status toward signing the agreement. Signed agreement must be submitted to apply for Contract of Finance.
- Form No.5 Agreement on the Allocation of JCM Credits
 - * Signed agreement must be submitted.
- Form No.6 Checklist for Submission of Proposal
- Other supporting documents

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Requirements of Co-applicant of JCM Model Project

- All members of the international consortium are responsible for the followings:
 - To cooperate with JCM methodology developers by providing information required to develop a methodology applicable to the project for GHG emission reductions;
 - To cooperate with TPEs by providing materials and information required to efficiently conduct validation of the abovementioned project and verification of GHG emission reductions at the project site;
 - To reduce, monitor and calculate GHG emissions utilizing the facilities/equipment with leading low carbon technology;
 - To estimate the GHG emission reductions by the project, and to report it to MOEJ annually until the end of the legal durable years of the facilities/equipment as stipulated by the Japanese law, which is unique to each project;
 - To request the Joint Committee to issue credits and take necessary actions such as application for the project registration by the Joint Committee set up or to be set up by the Governments of Japan and JCM partner country;
 - To deliver to the account of Japanese government at least fifty percent of the JCM credits of GHG issued corresponding to emission reductions achieved by the project for the abovementioned legal durable years;
 - To manage the facilities/equipment with due care of a prudent manager for their legal durable years as stipulated by the Japanese law in order to realize their efficient operation in accordance with the purpose of the financial support even after the completion of the model project.
 - To report to GEC in case that a constituent member is changed and to continue the above obligations from i. to vii.



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What is IGES?

- Institute for Global Environmental Strategies
- Established in 1998.
Head office: Hayama Town, Kanagawa Prefecture
- Research areas and bases

Research system of the Integrative Strategic Research Programme for the Seventh Phase

Ranked among the top 10 think tanks in the world for climate change

- According to a study by the International Center for Climate Governance (ICCG), IGES ranked 7th in the world in 2017 in the world's Climate Think Tank Rankings and 1st in regions other than Europe and the US (announced in June of this year). In 2016, IGES ranked 37th.
- According to the Global Go To Think Tank Index survey (University of Pennsylvania), IGES ranked 38th in the Environmental Policy Think Tanks group (6,500 organisations worldwide) (announced in January).

令和元年度 JCM 応募相談・参画促進に関するヒアリングシート

管理 No.	
ご回答日（面談日）	2020年 2月 22日
ご回答方法	メール / (面談) 於 ()
ご回答事業者名	(公財)地球環境戦略研究機関
ご担当者ご所属	北九州アーバンセンター
ご担当者氏名 (又はご回答者)	林 志浩
メールアドレス	hayashi@iges.or.jp
電話連絡先	093-681-1563
GEC 担当者	坂内修様
応募予定	(令和二年度) / 検討中 (提案時期：4月上旬 頃)
対象国	フィリピン
代表事業者名	株式会社ドーワテクノス
共同事業者名 (現地企業または SPC)	ダバオライト社 (Davao Light Power Company, Inc.) (Aboitiz Power Corp.傘下の電力会社)
事業名および概要	<p>全角 100 文字以内</p> <p>「街灯の LED 化事業」</p> <p>ダバオ市は条例 (No.0409-18 号, 2018) により、市の管轄域内の全ての街路灯を高圧ナトリウム (HPS) 灯から LED 照明に変換することを定めている。既に、市中心部の 1,000 本を対象に昨年 LED 化を実施。今後、順次 LED 化を実施する予定。LED 化に伴っては、ダバオライト社 (DLPC) が LED 化に伴う設備費を一次的に負担し、今後ダバオ市から支払われる電気料金 (LED 化の費用が上乘せ) で回収する予定。ダバオ市幹部、DLPC 副社長との数回の協議で、日本の LED 照明に大変興味を示しており、JCM 設備補助事業を活用し、都市まるごと低炭素 (街灯の LED) 化を目指している。</p> <p>また、現在北九州市との都市間連携事業で支援をしている「ダバオ市気候変動行動計画 (LCCAP)」に同 LED 化事業の実施を位置づけることで、実施可能性を高めるとともに、低炭素化事業の実施による GHG 削減効果を評価・公表することが期待できる。</p>
総事業費 (千円)	500,000 千円
補助対象経費 (補助金申請額) (千円)	<p>合計 500,000 千円 (70,000 千円)</p> <p>(内訳) 令和 2 年度：500,000 千円 (70,000 千円)</p> <p>令和 3 年度： 千円 (千円)</p> <p>令和 4 年度： 千円 (千円)</p>
補助率 (見込)	14% (費用対効果を 4,000 円/t-CO ₂ に合わせて場合)

事業期間	1年 / 2年 / 3年
対象サイト	ダバオ市内の街灯（約 22,800 本）
主な導入設備	高発光効率の LED ライト
法定耐用年数 とその根拠	8年（根拠：270 電球、電子管又は放電灯製造設備） 『減価償却資産の耐用年数等に関する省令』耐用年数表を参照して記載
想定 CO2 排出削減 量	2,193.26 tCO2 / 年（平均） （ GHG と CO2 が異なる場合は併記）
補助金費用対効果	法定耐用年数：8年 14,248 円 / tCO2 （補助率 50%の場合） 3,989 円 / tCO2 （補助率 14%の場合） 法定耐用年数：10年 11,399 円 / tCO2 （補助率 50%の場合） 4,103 円 / tCO2 （補助率 18%の場合）
事業性	投資回収年数：未定 年（補助金なし）、未定 年（補助金あり） IRR：未定 %（補助金なし）、未定 %（補助金あり）
代表（共同）事業者 の意思決定状況	・ DLPC の実質経営トップである Rodger Velasco 氏（副社長兼 COO）、Mark Valencia 氏（技術部門副社長）及びダバオ市と数回の協議を重ねており、日本側の提案内容に高い関心を示している。 ・ DLPC 側が技術仕様に基づく提案製品の技術評価を行い、日本側の提案製品の技術評価を終えている。
必要な許認可等 （取得予定年月）	特になし
資金調達方法およ び協議状況	DLPC が資金調達を行う（ダバオ市が支払う電気代に費用を上乗せして回収予定）。 当該プロジェクト予算はフィリピン国電力規制委員会の方で承認済 DLPC との提案製品に関する技術協議は終了（先方の技術仕様は全て満たしている）
本事業に関連する 政府調査・補助事 業実績	<u>廃棄物管理分野における北九州市及び関連機関によるダバオ市への支援実績</u> ・ 「ダバオ市における気候変動行動計画策定支援等による低炭素社会推進事業」環境省 低炭素社会実現のための都市間連携事業（2018 年度、令和元年度）
事業実施に関する 問題点や課題など	・ JCM 設備補助事業への申請手続きと代表事業者の責務など
その他ご質問やご 要望など	<u>JCM 設備補助事業の申請</u> ・ JCM 設備補助事業に申請する際の補助申請率について、費用対効果（4,000 円/t-CO2）を基準に申請するという考え方で良いか？ ・ 提出書類「共同事業者の経理状況説明書」について、どのような資料が妥当

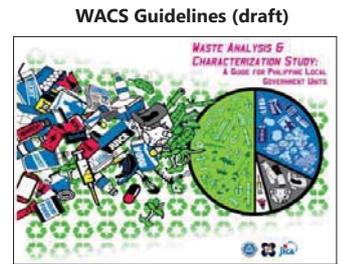
	<p>か？</p> <ul style="list-style-type: none">提出書類「投資回収年数及び内部収益率の計算過程・根拠の説明資料（補助あり、補助なしの2通り）」については、共同事業者（ダバオライト社）に提出を求めることになると思うが、具体的なフォーマットなど決まっているのか？また、根拠資料の添付なども求められるのか？来年度も4月上旬からの公募開始を予定しているのか？ <p><u>代表事業者の責務</u></p> <ul style="list-style-type: none">GHG 排出量を算出するために必要なモニタリングの実施について、具体的にどのような文書の提出が求められるのか？テンプレートがあれば、共有頂けないか？公募要領に「JCM 合同委員会に対し、当該プロジェクトによるクレジットの発行申請を行い、発行された JCM クレジットのうち 1/2 以上を、日本国政府の口座に納入すること。」とあるが、発行申請を行う具体的な手続きとはどのようなものか？ <p><u>国際コンソーシアムの組成</u></p> <ul style="list-style-type: none">設備補助事業の申請者（代表事業者）が商社の場合、利益排除（自社製品の調達を行う場合）は該当せず、申請者として利益を上げて良いという理解か？ <p><u>その他</u></p> <ul style="list-style-type: none">補助金の動きについて、国際コンソーシアムの図を基に確認したい。（補助金は環境省から代表事業者に支払われ、実際は補助金分を差し引いた金額で LED を DLPC 社（共同事業者）納品することになるのか？）
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以上

Cooperation on 3Rs and Waste Management between DENR and MOEJ

Shiko Hayashi, Programme Director
 Kitakyushu Urban Centre,
 Institute for Global Environmental Strategies
 2nd August 2019

Outputs from the Bilateral Cooperation



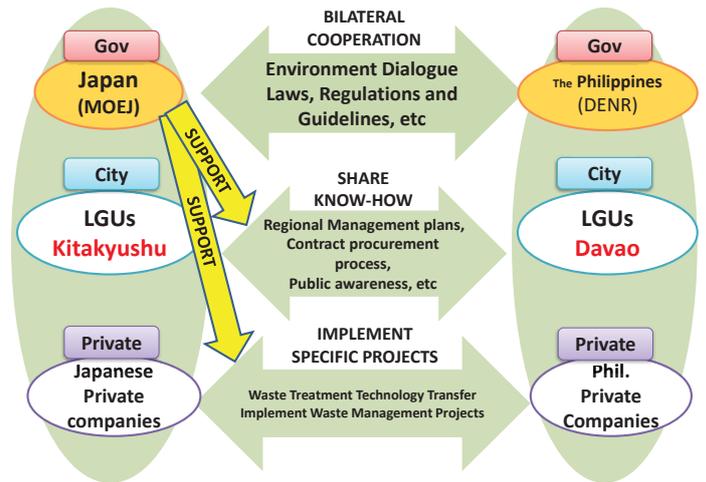
PPP Guidelines on solid waste management project (on-going)

Environmental Dialogue on Waste Management



Comprehensive cooperation by **Quezon, Davao and Cebu cities** selected as **model cities for WtE** in the Philippines, with their respective collaborative cities in Japan, namely **Osaka, Kitakyushu and Yokohama cities**

Cooperation Framework for Supporting Waste Management



Activities of the Bilateral Cooperation

Workshops for Waste to Energy

- Local Workshop in Quezon City and Davao City on Waste Management between the Philippines and Japan (24, 25 Jan. 2017)
- Joint Workshop on WtE Technology (Sep 15, 2017)
- Workshop on PPP Projects in the Area of Waste Management (1st Feb. 2018)
- Workshop on Waste-to-Energy Technology in Davao City (19 Feb. 2018)



Waste to Energy Study Tour

- Since 2015, we organized the study tour to Japan on WtE every years.



Emission Standards in Japan and EU

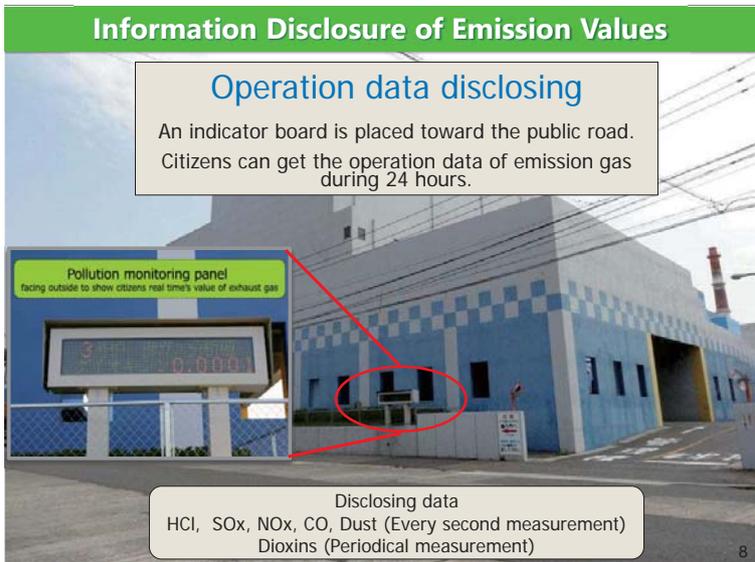
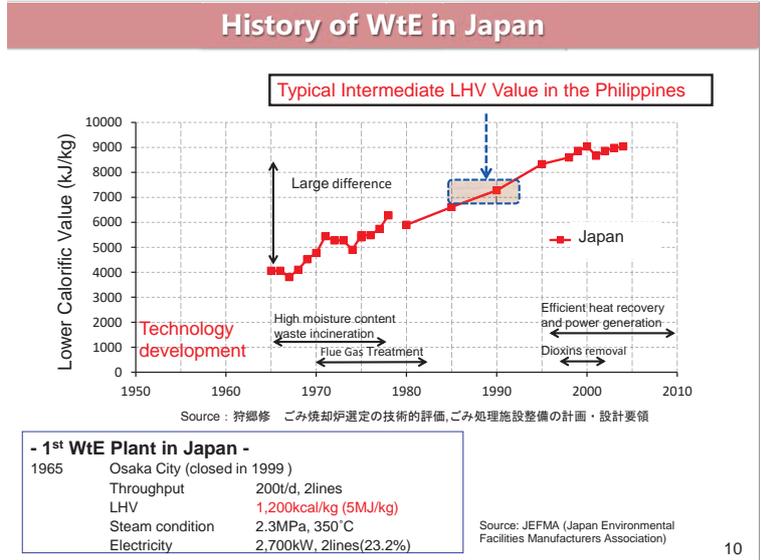
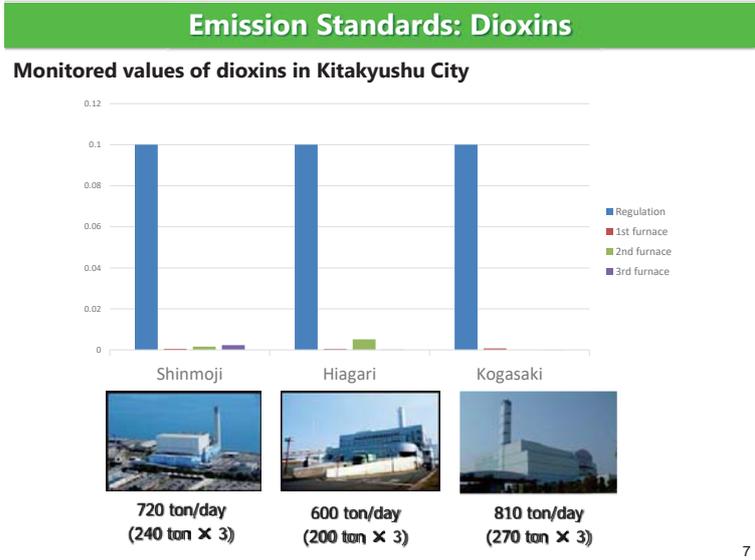
REGULATIONS AND STANDARDS FOR EMISSIONS IN JAPAN

- Flue gas → EMISSIONS STANDARDS (DRY GAS, 12% OXYGEN)
- Ash
- Sewage
- Noise
- Vibration
- Foul odors

Substance	Unit	Regulation	Stricter standards set by LGUs
Dust/ Particulates	mg/Nm ³	40 or less	10 or less
HCL	mg/Nm ³	430 (ppm)	10~50 (ppm)
SOx	K value	3 - 17.5	20~30 ppm
NOx	ppm	250 (ppm)	30~100 (ppm)
Dioxins	ng-TEQ/Nm ³	0.1	0.1
Mercury	mg/Nm ³	0.05 or less	There are no laws for emissions standards for other substances. However, there are substances for which standards have been set through municipal ordinances and environmental conservation conventions.
Cadmium	mg/Nm ³	1 or less	
Lead	mg/Nm ³	10 or less	
Fluorine	mg/Nm ³	9 or less	

Same as EU standard

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) Text with EEA relevance (Annex6, Part3, 1.4: Average emission limit value (ng/Nm³) for dioxins and furans over a sampling period of a minimum of 6 hours and a maximum of 8 hours.)



Dioxins Intake per person · day in Japan

- About 98% of dioxins are taken from food.
- Ministry of Health, Labour and Welfare and Ministry of the Environment recommend to eat various kinds of food in well-balance

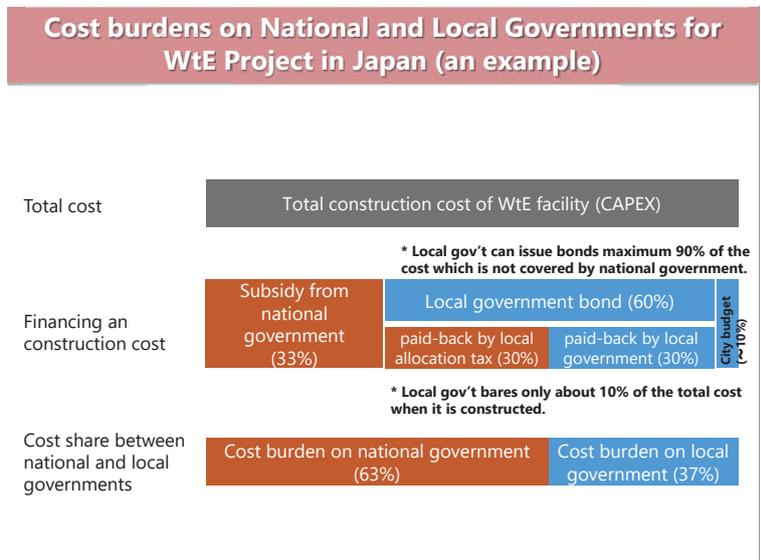
unit: pg-TEQ/kg/day (in 2009)		
Air	0.0090	Environment
Soil	0.0042	
Fish	0.78	Food
Meat, egg	0.040	
Milk, dairy	0.013	
Vegetable	0.00040	
Wheat, potato	0.0010	
Other	0.0038	

Actual intake in Japan:
about 0.85pg-TEQ/kg/day

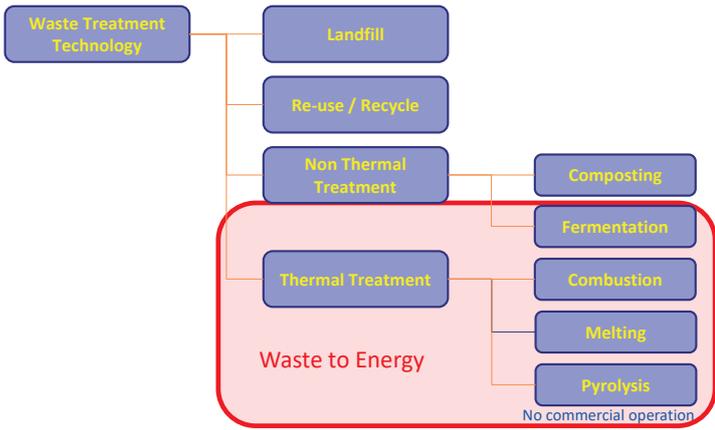
TDI in Japan:
4pg-TEQ/kg/day

Source: Ministry of the Environment, Japan
<https://www.env.go.jp/chemi/dioxin/pamph/2012.pdf>

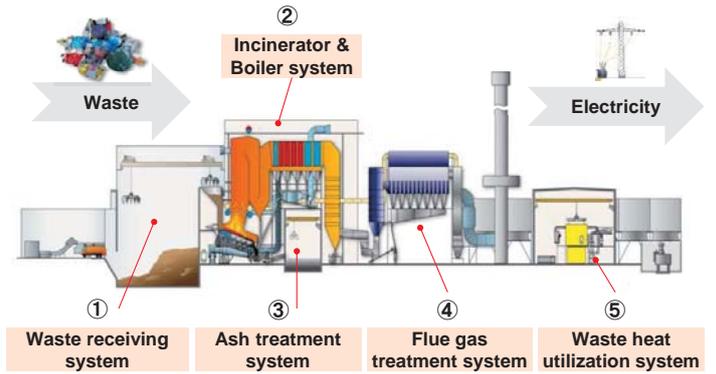
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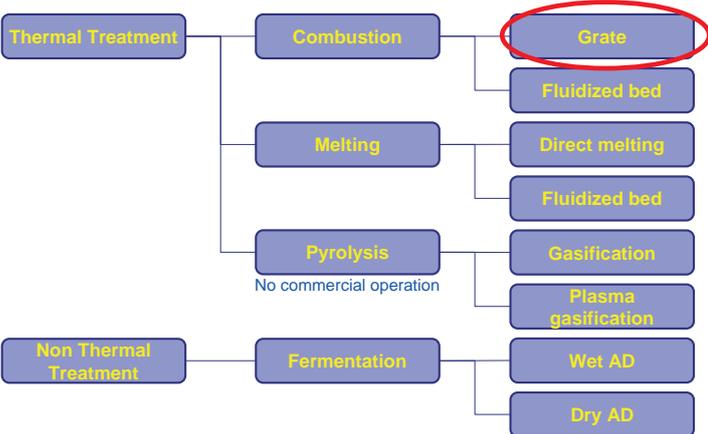
Types of Waste Treatment Technologies



Typical Flow of Waste-to-Energy Facility



Types of Waste Treatment Technologies

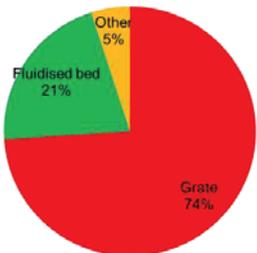


Types of Waste Treatment Technologies

Combustion : Grate



Worldwide Capacity by Type of Technology



Analysis of 692 units, commissioned between 2006 – 2015
Source : ecoprolog

Outline

- ❑ Waste is burned by autogenous combustion while moving on the grate.
- ❑ Air is provided under the grate.
- ❑ Waste is burned slowly on the grate for 1 to 2 hours.

Characteristic

- ❑ This is the **most proven technology**, and it is possible to achieve **stable operation**.
- ❑ It is possible to **treat a large amount of waste in short time**.
- ❑ It is easy to **meet fluctuation of waste quality** flexibly.
- ❑ It is **not necessary to pre-treat waste**.



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NOV 26 2019

DENR ADMINISTRATIVE ORDER
NO. 2019 - 21

SUBJECT: GUIDELINES GOVERNING WASTE-TO-ENERGY (WtE) FACILITIES FOR THE INTEGRATED MANAGEMENT OF MUNICIPAL SOLID WASTES

Pursuant to Section 8 (f) of Republic Act (RA) 9003, otherwise known as the Ecological Solid Waste Management Act of 2000, NSWMC Resolution No.669, Series of 2016, Adopting the Guidelines Governing the Establishment and Operation of Waste to Energy Technologies for Municipal Solid Wastes (MSW), Executive Order 192 (Providing the Reorganization of the Department of Environment, Energy and Natural Resources; Renaming it as the Department of Environment and Natural Resources) dated 10 June 1987, the Department of Environment and Natural Resources (DENR) hereby adopts and promulgates these guidelines on the establishment and operation of Waste-to-Energy (WtE) facilities for municipal solid wastes.

These guidelines also adhere to the policy of the government to promote compliance with Presidential Decree (PD) 1586 (Establishing an Environmental Impact Statement System), RA 6969 (Toxic Substances and Hazardous and Nuclear Wastes Act of 1990), RA 8749 (Philippine Clean Air Act of 1999); and RA 9275 (Philippine Clean Water Act of 2004).

SECTION 1. DECLARATION OF POLICY

It is hereby declared the policy of the State to adopt a systematic, comprehensive and ecological solid waste management program which shall ensure the protection of public health and environment and set guidelines and targets for solid waste avoidance and volume reduction through source reduction and waste minimization measures, including composting, recycling, re-use, recovery, green charcoal process, and other schemes, before collection, treatment and disposal in appropriate and environmentally-sound solid waste management facilities in accordance with ecologically sustainable development practices.

SECTION 2. OBJECTIVE

This Order is issued to provide guidelines on the evaluation, establishment, operation and de-commissioning of waste-to-energy (WtE) facilities for the integrated management of municipal solid wastes.

SECTION 3. SCOPE AND COVERAGE

These guidelines cover the requirements, and procedures on the establishment and operation of WtE facilities utilizing municipal solid wastes.

SECTION 4. DEFINITION OF TERMS

- a) **Biodegradable Waste** shall refer to solid wastes that can be decomposed by microorganism into humus-like product.
- b) **Bottom Ash** shall refer to the agglomerate ash formed that are too large to be carried in the flue gases and fall through open grates to an ash hopper at the bottom of the furnace.
- c) **Bureau** shall refer to the Environmental Management Bureau.
- d) **Clustering** is a strategy of pooling available resources of neighboring cities, municipalities or barangays for the establishment of a common solid waste management facility or service.
- e) **Continuous Emissions Monitoring System (CEMS)** shall refer to the total equipment used to sample, analyze and provide a permanent record of emissions or process parameters.
- f) **Decommissioning** is a process in which the WtE facility is placed in a safe and environmentally acceptable condition prior to cessation of operation.
- g) **Department** shall refer to the Department of Environment and Natural Resources.
- h) **Environmental Permits and Clearances** shall refer to the Environmental Compliance Certificate (ECC), Permit to Operate (PTO) and other legal requirements that must be secured prior to construction, set-up and operation of a WtE facility.
- i) **Dioxins and Furans** shall refer to the polychlorinated organic compounds namely polychlorinated dibenzo p-dioxins (PCDDs) and polychlorinated dibenzo-furans (PCDFs) that are generated unintentionally from waste incinerators and other industrial processes, and 17 of which are toxic in nature. The 17 toxic congeners include seven (7) 2,3,7,8 - substituted PCDDs and ten (10) 2,3,7,8- substituted PCDFs.
- j) **Effluent Standard** shall refer to any legal restriction on quantities, rates, and/or concentrations or any combination thereof, of physical, chemical or biological parameters of effluent which a person or point source is allowed to discharge into a body of water or land.
- k) **Emission** shall refer to any air contaminant, pollutant, gas stream or unwanted sound from a known source which is passed into the atmosphere.
- l) **Fly Ash** shall refer to the ash formed that are too small and light and are carried in the flue gases.
- m) **Feedstock** refers to the segregated biodegradable or residual waste materials supplied to the WtE facility to generate heat or electricity.
- n) **Hazardous wastes** shall refer to by-products, side-products, process residues, spent reaction media, contaminated plant or equipment or other substances from manufacturing operations and as consumer discards of

manufactured products which present unreasonable risk and/or injury to health and safety and to the environment.

- o) **Host LGU** shall refer to the LGU (province, city, municipality or barangay) where the waste to energy facility is located.
- p) **Materials Recovery Facility (MRF)** shall include solid waste transfer station or sorting station, drop off center, a composting facility and a recycling facility (DAO 2001-34).
- q) **Municipal Solid Waste (MSW) or Municipal Wastes** shall refer to wastes produced from activities within local government units which include a combination of domestic wastes from residential, commercial, institutional and industrial wastes and street litters (DAO 2001-34).
- r) **Recyclable Materials** shall refer to any waste material retrieved from the waste stream and free from contamination that can still be converted into suitable beneficial use or for other purposes
- s) **Residual Waste** shall refer to any material generated after the implementation of 3Rs (Reduce, Reuse, Recycle) with fuel value.
- t) **Residuals Containment Area (RCA)** shall refer to the temporary storage for segregated residual wastes.
- u) **Sanitary Landfill** shall refer to a waste disposal site designed, constructed, operated and maintained in a manner that exerts engineering control over significant potential environmental impacts arising from the development and operation of the facility.
- v) **Segregation** shall refer to a solid waste management practice of separating different materials found in solid waste in order to promote recycling and re-use of resources and to reduce the volume of waste for collection and disposal.
- w) **Source Segregated Waste** shall refer to solid waste segregated at the point of origin/generation.
- x) **Toxic Equivalent (TEQ)** shall refer to the overall toxicity of a sample as if it was comprised completely of 2,3,7,8 - tetrachlorodibenzo-p-dioxin. This is obtained by multiplying the individual congener concentrations by their respective TEF value and summing the results.
- y) **Toxic Equivalency Factors (TEFs)** shall refer to the relative degree of toxicity of PCDD/PCDF congeners in relation to the most toxic dioxin congener 2,3,7,8 - tetrachlorodibenzo-p-dioxin which is assigned a nominal value of 1.
- z) **Waste-to-Energy (WtE)** shall refer to the process of converting wastes with various technologies, usually the conversion of non-recyclable waste materials into useable heat, electricity, or fuel through a variety of processes.
- aa) **WtE Facility** shall refer to the structure/appurtenant facility where the waste-to-energy operations are housed.

SECTION 5. REQUIREMENTS

The following conditions must be met prior to the establishment of a WtE facility:

- a) All WtE facilities shall undergo Environmental Impact Statement System and secure all applicable environmental permits, clearances and other legal requirements from concerned agencies prior to construction, set-up and operation of a WtE facility.
- b) Documentation for compliance with the requirements of PD 1586 shall include an environmental and health risk assessment.
- c) The host LGU including the LGUs where the source of the feedstock will originate from shall ensure that the plan to establish and/or utilize WtE facility is integrated in their approved 10-year solid waste management plan consistent with the provisions of RA 9003.
- d) The host LGU are allowed to implement clustering and/or form partnerships with the private sector in the establishment, construction and operation of WtE facility.
- e) The proponent shall submit an Environmental Technology Verification (ETV) Statement and Report following the DOST ETV Protocol as per DENR-DOST Joint Administrative Order 2006-001.
- f) The WtE facility owner shall:
 - i. Develop a manual of operation and quality assurance and control to be submitted to EMB for monitoring purposes.
 - ii. Maintain, at the highest possible standards, a quality control/assurance system to demonstrate its ability to consistently provide products and services that meet applicable statutory and regulatory requirements.
 - iii. Implement and communicate a detailed emergency response plan to ensure effective and rapid containment and clean-up in the event of an emergency incident. The facility must be equipped with adequate fire-fighting devices certified by the Bureau of Fire Protection.
 - iv. Provide appropriate personal protective equipment and medical care in compliance with existing laws, rules and regulations to all personnel of the facility directly handling or exposed to waste materials, in-process materials and finished products.
 - v. Ensure implementation of resource efficient and cleaner production program that follows the waste management hierarchy of source reduction, recycling, treatment and safe disposal.
 - vi. Provide appropriate, recent and state of the art pollution control and abatement facilities to ensure that all emissions and effluents comply with relevant environmental standards.

- vii. Avail services of EMB registered transporters and treatment, storage and disposal facilities for any hazardous waste resulting from the operations of the WtE facility.

SECTION 6. OPERATIONAL GUIDELINES FOR WTE FACILITY

6.1 Waste Delivery Control

Acceptable Municipal Solid Waste for WtE Facility

The facility shall only accept source segregated biodegradables or residual wastes collected from households, MRFs, Residual Containment Areas (RCAs), Sanitary Landfills and other disposal facilities.

For unsegregated wastes resulting from calamities, flooding and clean up, the waste must undergo pre-processing to achieve the quality and suitability as feedstock.

The WtE facility shall document and maintain records indicating the quantity in weight, source and type of source-segregated wastes to be processed including the date and time received. (*Annex A*)

6.2 Storage Facility

Appropriate storage facilities should be provided for source segregated wastes, in-process materials and any by-product from the WtE facility operation. Such storage shall institute measures to address the risks of potential explosion, combustion, corrosion, contamination, infection and odor emission that could pose potential hazard to human health and the environment.

6.3 Environmental Monitoring

- a) The WtE facility operator shall submit to EMB Regional Offices quarterly Self-Monitoring Report and semi-annual Compliance Monitoring Report in accordance with DAO 2003-27 and/or new relevant issuances thereof.
- b) The WtE facility operator shall install CEMS, linked with the EMB, measuring PM, NO₂, CO, HCl, Temperature and other parameters as determined by Bureau.
- c) In coordination with EMB, WtE facilities utilizing thermal process (whether burn or non-burn) must conduct sampling and analysis for dioxins and furans based on EMB Memorandum Circular No. 2007-003 (*Policy on Compliance and Permitting for Industrial Facilities Relating to Air Quality*) following the prescribed methodology; all average values of dioxins and furans measured over the sampling period of a minimum of six (6) hours and a maximum of eight (8) hours **must not exceed the limit value of 0.1 nanogram toxic equivalents per normal cubic meter (ng-TEQ/NCM)**. (For this guideline, TEF values to be used for calculation of Toxic Equivalents (TEQs) of a particular sample is based on the 1989 update of the United States Environmental Protection Agency (US

EPA) adopting the 1989 International NATO/CCMS TEF values, otherwise represented as I-TEF).

- d) Effluents from WTE facilities must conform with DENR Administrative Order No. 2016-08 (Water Quality Guidelines and General Effluent Standards) and/or the latest relevant issuance thereof.

6.4 Documentation and Data Management

All aspects of WtE facility operations must be well documented. As such, documents and records as listed below shall be maintained at least five (5) years and be made available for inspection:

- a) Delivery record of each waste material received in the facility
- b) Daily processing operation log sheet showing or attaching the following information:
 - i. Quantity of waste materials processed
 - ii. CEMS data online submission to EMB
- c) Laboratory analysis of effluent, source emission, fly ash and bottom ash.

6.5 Social Accountability

The facility owner shall endeavor to establish partnership with stakeholders through education and training, infrastructure improvements, disaster risk reduction and management and such other social development activities.

The WtE facility shall maintain a Light-Emitting Diode (LED) or similar system/device display board, in front of its site and within view of the general public, containing updated information on its air emissions and effluent.

6.6 Interim Cease and Desist Order by the Secretary

Whenever there is an exceedance of the emission standards set by the Department or if there is imminent threat to life, public health, safety or general welfare, or to plant or animal life, an interim order for the closure, suspension, or cessation of operations of the WtE facility may be immediately issued by the DENR Secretary or his authorized representative, without the need for a prior public hearing (Sec 45, RA 8749).

The interim cease and desist order shall be immediately executory and shall remain in force and effect until the WtE operator has reduced the limit value of the dioxin and furans to 0.1 nanogram toxic equivalent per normal cubic meter (ng-TEQ/NCM), or until a temporary lifting order is issued by the Pollution Adjudication Board (PAB) or an injunctive writ is issued by a Court of Law. (Sec 1, Rule X, of PAB Resolution No. 1, Series of 2010)

SECTION 7. DECOMMISSIONING OR ABANDONMENT

A detailed Decommissioning/Abandonment Plan shall be submitted to the Bureau for approval at least one (1) year prior to the decommissioning or abandonment of the facility. The Plan shall include rehabilitation measures, clean-up activities, remediation of areas affected by the WtE facility and proposed alternative post land use of the area.

SECTION 8. FINES AND PENALTIES

Fines and penalties for violating these guidelines shall be governed by pertinent provisions in Presidential Decree 1586 (Establishing an Environmental Impact Statement System), RA 6969 (Toxic Substances and Hazardous and Nuclear Wastes Act of 1990), RA 8749 (Philippine Clean Air Act of 1999), RA 9003 (Ecological Solid Waste Management Act of 2000), and RA 9275 (Philippine Clean Water Act of 2004).

Violation of any provision of these guidelines by WtE facility may result to the suspension or cancellation of relevant permits and clearances and/or the filing of appropriate charges, pursuant to relevant environmental laws and policies as determined by the Department.

SECTION 9. TRANSITORY CLAUSE

Any establishment operating a WtE facility using MSW as feedstock prior to the effectivity of this DAO shall be given one (1) year to comply with all permitting requirements set forth provided, that such facility does not cause or pose imminent threat to property, public health and environment as determined by DENR-EMB or other government agencies concerned.

SECTION 10. EFFECTIVITY

This guideline shall take effect fifteen (15) days after its publication in two (2) newspapers of general circulation and upon submission of a copy thereof to the Office of the National Administrative Registry (ONAR) at the University of the Philippines Law Center.


ROY A. CIMATU
Secretary





Republic of the Philippines
City of Davao
OFFICE OF THE VICE MAYOR

January 14, 2020

MR. KAZUHIKO TAKEUCHI
President
Institute for Global Environmental Strategies
2108-11 Kamiyamaguchi, Hayama, Miura District,
Kanagawa 240-0115, Japan

Dear President Takeuchi:

Greetings!

Last January 12, 2020, the Philippine Institute of Volcanology and Seismology (PHIVOLCS) raised the alert level of the Taal Volcano eruption to four, prompting warnings of a possible explosive eruption. Hence, flights in the Davao City airport were canceled, including mine and the rest of the Davao City delegates. There is no advisory as to when the operations of the airport will return to normal; therefore, I could not rebook my flight at the soonest possible time.

On behalf of the Davao City delegation, please accept my sincerest regrets for being unable to attend the **Seminar on City-to-City Collaboration for Creating Low-carbon Society** as well as the site visits in the cities of Tokyo and Kitakyushu.

I would also like to extend my gratitude to the organizers of this event for the opportunity and invitation. As much as I would like to visit your beautiful city, my security team have already made precautions regarding the risk of our flight and decided to cancel the trip officially. I earnestly apologize for any inconvenience this may have caused you.

Rest assured, Davao City will remain committed to strengthen our partnership with your government and hope to offer our participation in the future. I am hoping that we will still be working with each other soon. Please do not hesitate to contact my office if you need anything.

Davao City will always be open if you decide to come and visit us.

Thank you for your consideration and understanding.

Best regards,



SEBASTIAN Z. DUTERTE
City Vice Mayor

Second Floor, SP Building, San Pedro St., Davao City
(082) 222-0855 loc. 428

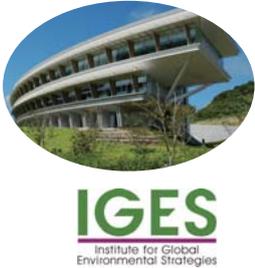


LIFE IS HERE

City-to-City Collaboration Programme between Davao City and City of Kitakyushu: Supporting Davao to become Low-carbon City

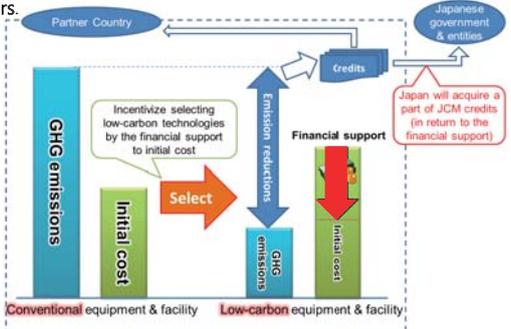
January 14th, 2020

Shiko Hayashi
Programme Director, Kitakyushu Urban Centre



Financing Programme for JCM Model Project

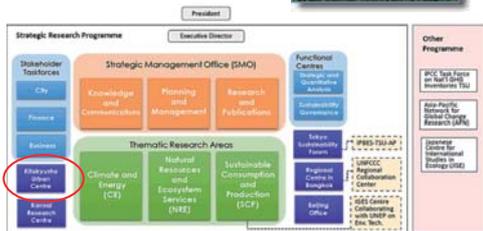
- Scope of the financing:
Facilities, equipment, vehicles, etc. which **reduce CO₂ from fossil fuel combustion** as well as construction cost for installing those facilities, etc.
- Eligible projects:
Starting installation after the adoption of the project and finishing installation **within three years**.



Source: MOE Japan

What is IGES?

- Institute for **G**lobal **E**nvironmental **S**trategies
- Established in 1998.
Head office: Hayama Town, Kanagawa Prefecture
- Research areas and bases



Research system of the Integrative Strategic Research Programme for the Seventh Phase

Ranked among the top 10 think tanks in the world for climate change

- According to a study by the International Center for Climate Governance (ICCG), IGES ranked 7th in the world in 2017 in the world's Climate Think Tank Rankings and 1st in regions other than Europe and the US (announced in June of this year). In 2016, IGES ranked 37th.
- According to the Global Go To Think Tank Index survey (University of Pennsylvania), IGES ranked 38th in the Environmental Policy Think Tanks group (6,500 organisations worldwide) (announced in January).

Outline of City-to-City Collaboration Programme

- Basic concept is transferring the **knowledge and experience of Japanese cities for creating low carbon society** to foreign cities which have the mutual relationship.
- Private companies formulate the consortiums with Japanese cities and support foreign cities to create low carbon cities.

Ex) Support to design city masterplan and install low carbon technology etc.



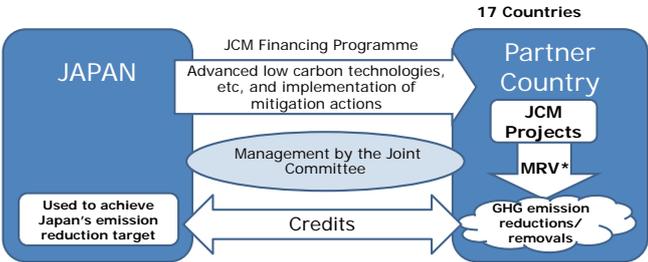
- **Creating low carbon project** efficiently and effectively
- **Designing the local systems** to promote low carbon society
Ex) low carbon action plan and technology evaluation criteria etc.
- **Capacity building** for local staffs

Promotion of private investment
Self-sustained development of foreign city
Transferring low-carbon technology to other fields

Source: MOE Japan

Basic Concept of Joint Crediting Mechanism (JCM)

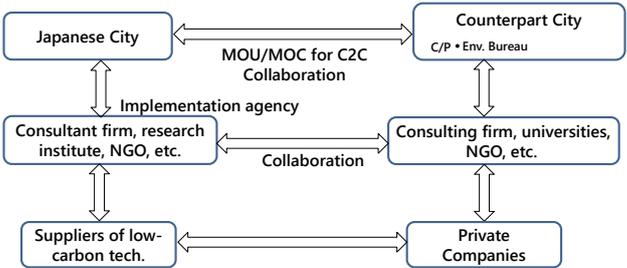
- Facilitating diffusion of **leading low carbon technologies, products, systems, services, and infrastructure** as well as implementation of mitigation actions of partner countries.
- Evaluating contributions from Japan to **GHG emission reductions or removals in a quantitative manner** by MRV.
- Contributing to achieve Japan's emission reduction target of the UNFCCC by facilitating global actions for GHG emission reductions.



*measurement, reporting and verification

Source: MOE Japan

Framework of City-to-City Collaboration Programme

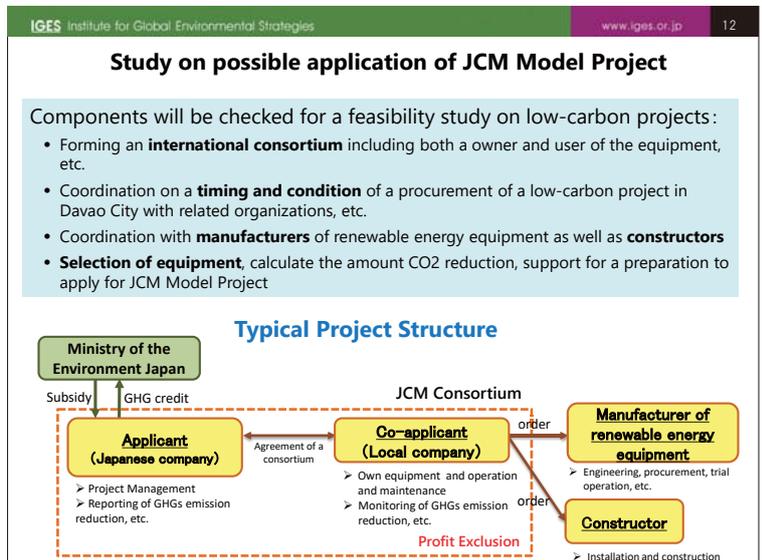
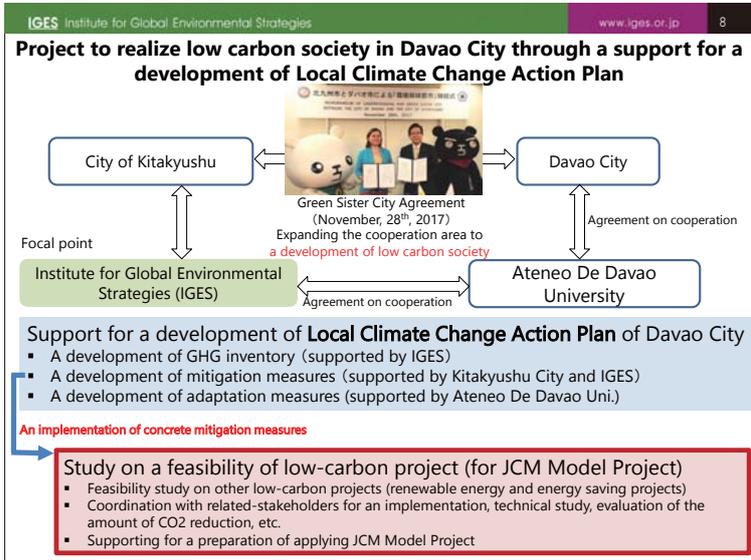
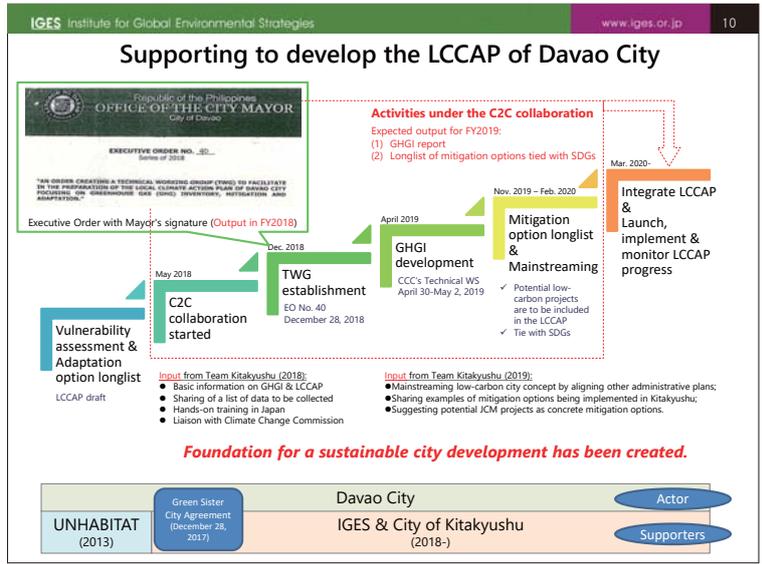
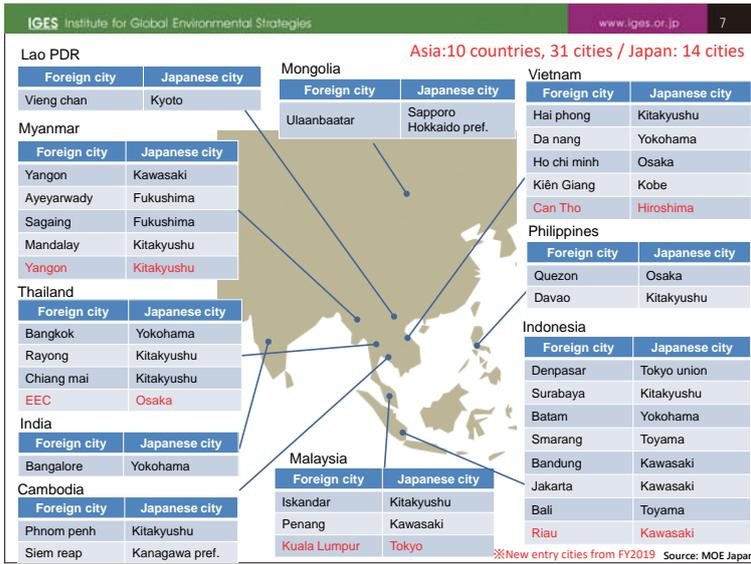


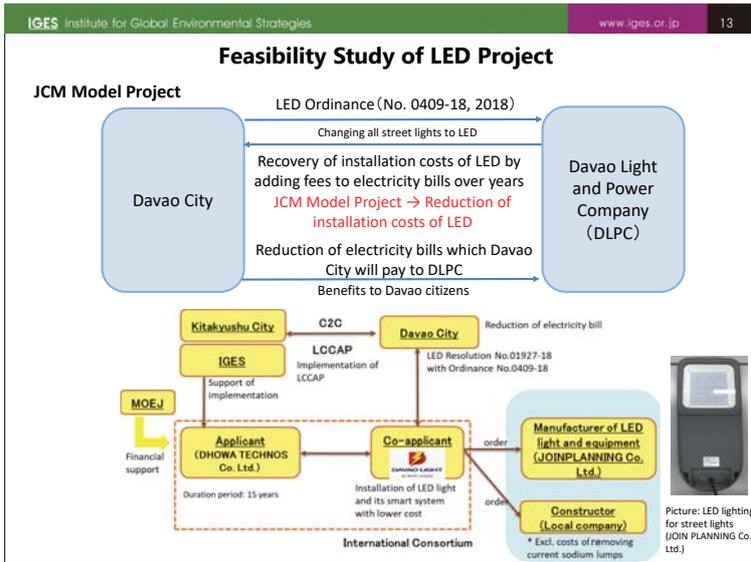
Supporting to develop a plan/policy, etc. as well as capacity building

- Support for a development of Local Climate Change Action Plan or etc.
- incl. GHG Inventory, technical evaluation of a project proposal, appropriate selection process, etc.

Feasibility study of an introduction of low-carbon technologies

- Coordination with related agencies & private companies to study a feasibility of low-carbon project, evaluation of potential amount of CO₂ reduction, etc.
- Preparing for an application for JCM Model Project

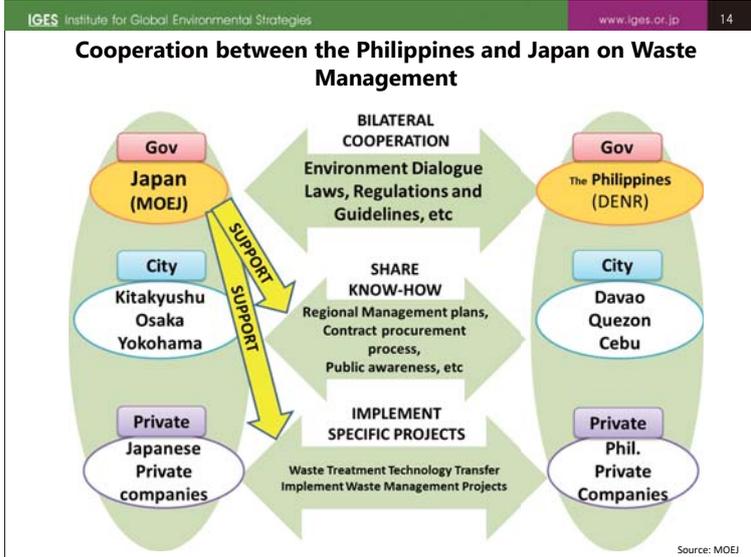




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Thank you.

For any further questions, please contact hayashi@iges.or.jp



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Environment Dialogues between DENR and MOEJ

Quezon City (with Osaka City), Davao City (with Kitakyushu City), and Cebu City (with Yokohama City) as Model Cities for WtE

- ✓ Organized “**Joint workshop on waste management between Japan and the Philippines**” to deepen understanding of current situation of waste management practices in Japan and the Philippines
- ✓ Cooperated to formulate a **draft WtE guideline (NSWMC resolution)**
- ✓ Organized a **study tour to Japan to learn about WtE management in Japan**

令和元年度
低炭素社会実現のための都市間連携事業委託業務
(ダバオ市における気候変動行動計画策定支援等による低炭素社会推進事業)
報告書
令和2年2月

公益財団法人地球環境戦略研究機関(IGES)北九州アーバンセンター
Kitakyushu Urban Centre, Institute for Global Environmental Strategies (IGES)

〒805-0062 北九州市八幡東区平野1丁目1番1号 国際村交流センター3F
International Village Centre 3F, 1-1-1 Hirano, Yahata-higashi-ku, Kitakyushu City, 805-0062
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