エチオピア国
水・エネルギー省
エチオピア水技術機構

エチオピア国
水技術機構（EWTI）研修運営管理能力
強化プロジェクト

事業完了報告書

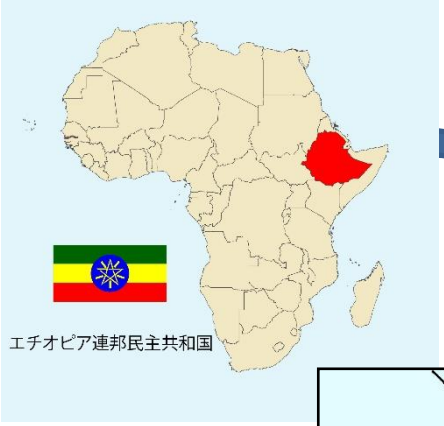
令和 6 年 8 月
（2024 年）

独立行政法人
国際協力機構（JICA）

株式会社アースアンドヒューマンコーポレーション
国際航業株式会社
アイ・シー・ネット株式会社

環境
JR
24-069

エチオピア連邦民主共和国位置図



【エチオピア国州別マップとアディスアベバの位置】

EWTI

EWTI の新事務棟。総裁と各局長が執務している。

実技実習の様子
（電気機械整備コース）

写真集

成果 1 の活動

PDCA ワークショップ
（2017 年 7 月 12～14 日、EWTI）

研修需要調査の報告会
（2017 年 7 月 18 日、EWTI）

技術ギャップ調査、井戸の視察
（2017 年 9 月、オロミア州）

研修運営管理ガイドライン version1
ワークショップ
（2019 年 2 月 12 日、アディスアベバ市内）

ナレッジマネジメント会議
（2019 年 3 月 4 日、EWTI）

トレーナーチームによる反省会、
第 2 回パイロット研修（地下水開発）
（2019 年 4 月 1 日~18 日、EWTI）

研修運営管理ガイドライン普及
ワークショップ
（2019 年 10 月、オロミア州）

第 3 回パイロット研修の準備会合
（2019 年 11 月 6 日、EWTI）

成果 1 の活動

ビジネスマネジメントワークショップ
（2021 年 9-10 月、アディスアベバ市内）

研修運営管理ガイドライン最終検討
ワークショップ
（2023 年 1 月 26 日、アディスアベバ市内）

成果 2 の活動

ID ワークショップ Part 1
（2017 年 12 月 25～26 日、EWTI）

トレーナーの能力強化研修（地下水探査）
（2018 年 1 月、オロミア州）

トレーナーの能力強化研修
（電気機械・掘削機械）
（2018 年 2 月、EWTI）

トレーナーの能力強化研修（掘削技術）
（2018 年 3 月、EWTI）

トレーナーの能力強化研修（電気機械整備）
（2018 年 10 月 15 日~19 日、EWTI）

トレーナーの能力強化研修（掘削機械整備）
（2018 年 10 月 3 日~31 日、EWTI）

成果 2 の活動

トレーナーの能力強化研修（掘削技術）
（2018 年 6 月、オロミア州）

トレーナーの能力強化研修（掘削技術）
（2018 年 11 月、アムハラ州）

第 1 回パイロット研修（電気機械整備）
（2018 年 10 月 22 日~11 月 2 日、EWTI）

第 1 回パイロット研修（掘削機械整備）
（2018 年 10 月 29 日~11 月 9 日、EWTI）

第 2 回パイロット研修（電気機械整備）
（2019 年 2 月 25 日~3 月 8 日、EWTI）

第 2 回パイロット研修（地下水開発）
（2019 年 4 月 1 日~18 日、EWTI）

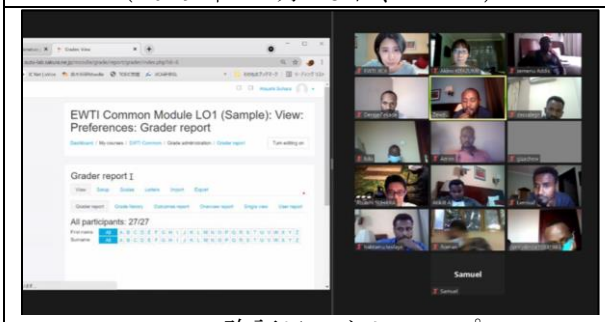
第 2 回パイロット研修（掘削技術）
（2019 年 4 月 8 日~19 日、EWTI）

TTLM・ガイドライン改訂ワークショップ
（2019 年 7 月、アディスアベバ市内）

成果 2 の活動

第 3 回パイロット研修／国際コース
オープニングセレモニー
（2019 年 11 月 18 日、EWTI）

第 3 回パイロット研修／国際コース
（泥水掘削コース）、振り返りセッション
（2019 年 11 月、EWTI）



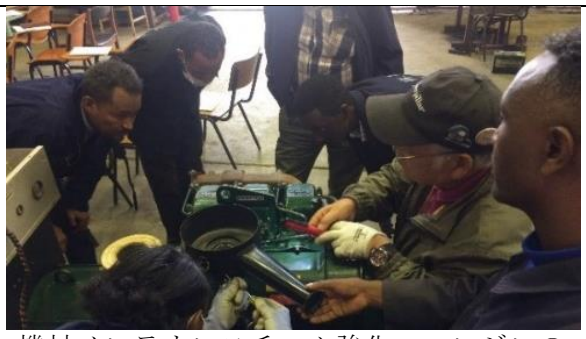
TTLM 改訂ワークショップ
（2021 年 9 月 1～9 日、14～18 日、
オロミア州およびオンライン会議）

ハイブリッド研修によって得られた課題など
の EWTI マネジメント層へ共有
（2024 年 5 月、プロジェクトオフィス）

成果 3 の活動

機材メンテナンスチームの結成ミーティング
（2019 年 2 月 2 日、EWTI）

長期研修コース実施に向けた TVET との
意見交換会
（2019 年 10 月、アディスアベバ市内）



機材メンテナンスチーム強化：エンジンの
オイル漏れ箇所の特定、対処方法指導
（2019 年 10 月 2～4 日、EWTI）

機材メンテナンスチーム強化：
掘削機械のサクションホースの修復
（2019 年 10 月 22～11 月 8 日、EWTI）

成果 3

内部研修：データマネジメント研修
（2022 年 9 月 21 日、EWTI）

内部研修：井戸掘削 OJT
（2023 年 4 月、EWTI）

合同調整委員会（JCC）

第 1 回 JCC（2017 年 7 月 25 日、EWTI）

第 3 回 JCC（2018 年 4 月 27 日、EWTI）

第 5 回 JCC（2018 年 11 月 27 日、EWTI）

第 6 回 JCC（2019 年 4 月 9 日、EWTI）

第 8 回 JCC（2020 年 9 月 8 日、EWTI および
オンライン会議）

第 12 回 JCC（2024 年 7 月 25 日、EWTI）

本邦研修

（2018 年 5 月 24 日、（株）利根エンジニア）

（2018 年 5 月 25 日、東京都水道局）

本邦研修（電気機械整備コース）
2019 年 8 月 26 日～9 月 6 日、発電機整備の
トラブルシューティング（2）
（19/8/29（株）テクニカ）

本邦研修（地下水開発・掘削コース）
2019 年 8 月 26 日～9 月 6 日
展示の種類や方法について学ぶ様子（2）
（19/8/28 横浜水道記念館）

電気機械整備コース
研修時間外を活用して発表資料を作成する
様子（2019 年 9 月 5 日 JICA 東京）

地下水開発・掘削コース帰国後のアクション
プラン発表会の様子
（2019 年 9 月 6 日 JICA 東京）

イベントへの参加

ジャパン・フェスティバルへの出展
（2018 年 10 月 21 日、アディスアベバ
市内）

世界水の日イベント
（2019 年 3 月 22 日~23 日、アディスアベバ
市内）

プロジェクト事業完了報告書

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添付資料

技術協力成果品

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略　語　表

略語	英文	和文
AAWSA	Addis Ababa Water and Sewerage Authority	アディスアベバ上下水道公社
COC	Certificate of Competency	職業訓練技能認定証
DG	Director General	総裁
DT	Drilling Technology	掘削技術
EHC	Earth and Human Corporation	（株）アースアンドヒューマンコーポレーション
EIAR	Ethiopian Institute of Agricultural Research	エチオピア農業研究所
EMI	Ethiopian Management Institute	エチオピア・マネジメント・インスティテュート
EMMT	Electro-mechanical Machinery Maintenance Technology	電気機械整備技術
EOS	Ethiopian Occupational Standard	エチオピア職業標準
ETB	Ethiopian Birr	エチオピア・ブル（現地通貨）
EWTEC	Ethiopia Water Technology Centre	エチオピア水技術センター
EWTI	Ethiopia Water Technology Institute	エチオピア水技術機構
GIS	Geographic Information System	地理情報システム
GWDM	Groundwater Development and Management	地下水開発管理
GTP	Growth and Transformation Plan	国家成長･変革計画
ID	Instructional Design	インストラクショナルデザイン
JCC	Joint Coordination Committee	合同調整委員会
JICA	Japan International Cooperation Agency	独立行政法人 国際協力機構
JMP	Joint Monitoring Programme	共同モニタリングプログラム
LAP (テスト)	Learning Activity Performance (Test)	学習活動パフォーマンステスト（エチオピア教育省で定められたTVET教材の一部）
LG	Learning Guide	ラーニングガイド
LMS	Learning Maanngement System	教育管理システム
LO	Learning Outcome	学習目標
MDGs	Millennium Development Goals	ミレニアム開発目標
MoE	Ministry of Education	教育省
MoWE	Ministry of Water and Energy	水エネルギー省
NGO	Non-Governmental Organization	非政府組織
NRRTC	National Rice Research and Training Center	国立イネ研究研修センター
OHS	Occupational Health and Safety	職場における健康と安全
OJT	On the Job Training	職場における実践研修
PC	Personal Computer	パーソナルコンピューター
PDCA	Plan-Do-Check-Act	計画-実行-評価-改善
PDM	Project Design Matrix	プロジェクトデザインマトリックス
PEG	Performance Evaluation Guide	評価ガイド
PO	Plan of operation	実施計画
R/D	Record of Discussions	討議議事録
SMART	Simple, Market based, Affordable and Repairable Technology	スマートテクノロジー（低コスト水技術）
SNNPR	Southern Nations, Nationalities and People’s Region	南部諸民族州（旧）
TNA	Training Needs Assessment	研修要望調査
TOR	Terms of Reference	指示書
TOT	Training of trainers	トレーナー研修

略語	英文	和文
TTLM	Training Teaching and Learning Material	教材（エチオピア教育省で定められた TVET 教材のパッケージ）
TVET	Technical and Vocational Education and Training	職業訓練
TVETC	Technical and Vocational Education and Training College	職業訓練校
UC	Unit of Competence	職業能力単元
UNICEF	The United Nations Children's Fund	国連児童基金
W-TVETC	Water – Technical and Vocational Education and Training College	水技術職業訓練校（水技術部門を有する職業訓練校）
WBS	Work Breakdown Structure	作業分解構成図
WHO	World Health Organization	世界保健機関
WTETD	Water Technology Education and Training Drectorate	教育訓練総局
WWCE	Water Works Construction Enterprise	井戸建設公社
WWDE	Water Works Drilling Enterprise	掘削公社

第1章　プロジェクトの概要

1.1　プロジェクトの背景

(1) エチオピア水セクター概観とEWTI設立の背景

UNICEF/WHO が発行したミレニアム開発目標（MDGs）のモニタリング報告書（JMP 2015）によると、エチオピア（以下、「エ」国）は MDGs の安全な水へのアクセス率の目標値である 57%を達成したとしているが、依然世界で最も給水率の低い国のひとつである[1]。プロジェクト開始当時、「エ」国の水セクターでは新たな国家計画である成長と変革計画 II（Growth and Transformation Plan：GTP-II、2015/16~2019/20）に基づいて活動を行っており、2020 年に安全な水へのアクセス率 83%（都市部 75%、村落部 85%）を達成することを目標として掲げていた。

このような水セクターの動きの中、給水率の向上のために不可欠な、既存施設の維持管理やリハビリを担える人材の圧倒的な不足という状況に対し、JICA は 1998 年より 15 年間にわたってエチオピア水技術機構（以下、EWTI）の前身であるエチオピア水技術センター（以下、EWTEC）への支援を行った。研修実施に必要なインフラ基盤の整備、機材などハード面での支援に加え、技術協力プロジェクトを通じて、研修モジュールや教材作成を含む研修内容の整備やトレーナー陣の能力向上、組織管理能力支援などを行い、水技術における人材育成の専門研修機関としての EWTEC の基盤づくりに貢献した。2013 年、EWTEC は国立公益機関 EWTI へと昇格し、名実ともに人材育成の中核機関としてその地位を確実なものとした。

水セクターの GTP-II では、2020 年までに安全な水へのアクセス率の目標達成のためには、13,000 名の水技術者および技能者の育成が必要とされている。EWTI は、職業訓練校（TVETC）や大学研究機関などと並んで技術人材の育成と技術向上に重要な役割を期待されているが、トレーナーの実技能力不足、研修運営能力の不足、組織運営における能力不足などの課題が残っており、国を代表する研修機関として持続していくためには、それらの弱点を克服し、自立した研修機関として十分な人材と組織能力を有することが不可欠である。2016 年、JICA は「エ」国の要請に応えて調査団を派遣し、2017 年 3 月、「エチオピア国水技術機構研修運営管理能力強化プロジェクト」の実施について合意し討議議事録に署名を行い、同年 6 月、3 年間[2]のプロジェクトを開始する運びとなった。本プロジェクトで取り扱う課題について、下図の通り整理した。

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[1] *世界平均 91％、最貧国平均 69％、サブサハラアフリカ平均 68％（UNICEF/WHO, 2015, JMP Report）*

[2] *新型コロナウィルスによる影響およびその後の追加活動の実施により、プロジェクト実施期間は最終的に合計 7 年 3 か月に延長された。*

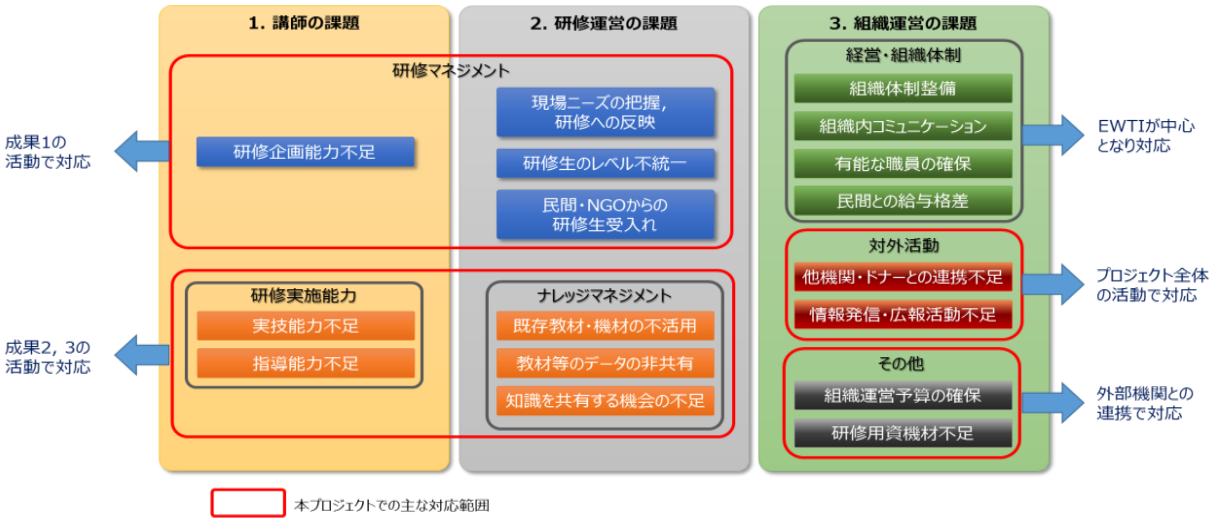


図 1-1：EWTI の課題とプロジェクトで取り組む活動範囲

1.2 プロジェクトのデザイン

(1) プロジェクトの目標と期待される成果

本プロジェクトの目標と期待される成果は以下の通り。本書中、PDM 上の文言は、Ver.5 の表記に統一した。

表 1-1：プロジェクト目標、期待される成果

上位目標	プロジェクトで確立した研修運営・管理体制に基づき、EWTI 教育訓練総局が持続的に水分野の人材育成を実施している
プロジェクト目標	EWTI 教育訓練総局の研修運営・管理体制が強化される
成果	1. PDCA サイクル[3]に基づき、EWTI 教育訓練総局の研修マネジメント能力が強化される 2. パイロット研修を通じて、同研修を担当する EWTI トレーナーの指導能力が向上する 3. EWTI 教育訓練総局において内部研修の実施体制が整備される

(2) プロジェクト実施期間

本プロジェクトは、2017 年 6 月から 2024 年 8 月までの 7 年 2 ヵ月間（86 カ月）実施された。プロジェクト期間は以下の 3 期に分けて実施された。

第 1 期　　2017 年 6 月～2018 年 7 月

第 2 期　　2018 年 8 月～2019 年 5 月

第 3 期　　2019 年 6 月～2024 年 8 月

[3] *Plan-Do-Check-Act サイクル。事業活動における生産管理や品質管理などの管理業務を円滑に進める手法の一つ。*
(参考　https://ja.wikipedia.org/wiki/PDCA%E3%82%B5%E3%82%A4%E3%82%AF%E3%83%AB)

(3) 相手国関係機関

本プロジェクトが関係する主な関係機関は以下の通りである。技術移転の対象となるカウンターパート名簿および組織図は、添付資料 1 に取りまとめた。

監督責任機関：水エネルギー省

実施機関（カウンターパート）：エチオピア水技術機構（EWTI）教育訓練総局

関係機関：水技術部門を有する職業訓練校（W-TVETC）、アディスアベバ上下水道公社（AAWSA） など

(4) 業務の対象地域

対象地域は、アディスアベバ市である。ただし、技術ギャップ調査では、ティグライ州、オロミア州、アムハラ州、南部諸民族州、ベニシャングル・グムズ州も対象とした。パイロット研修の実習現場やモニタリング対象地として、上記各州を含む地方への出張が見込まれていたが、2020 年以降、新型コロナウィルスの拡大及び終息に至るまでの間、また、2021 年から国内情勢の悪化等により、地方での活動が著しく制限されることになり、計画していたパイロット研修のフォローアップ調査やエンドライン調査において、地方での情報収集が十分にできなかった。

(5) PDM の変遷

第 1 期中の 2017 年 11 月、2018 年 7 月に、それぞれ Ver.0 から Ver.1、Ver.1 から Ver.2 への変更が行われた。さらに、第 2 期中の 2019 年 4 月、Ver.2 から Ver.3 への変更が行われた。第 3 期には、2021 年 9 月及び 2022 年 9 月にそれぞれ Ver.3 から Ver.4、Ver.4 から Ver.5 への変更が行われた。変更経緯は表 1-2 に記した。

第 1 回目の変更（Ver.1）では、主に呼称の統一や英文のエラー修正などを中心に修正を行った。第 2 回目の変更（Ver.2）では、プロジェクト活動の過程の中でより明確になったプロジェクト内容や技術成果品の位置付けなどの明文化、実態に合わせた文言の修正などを提案した。第 3 回目の変更（Ver.3）では、第 3 期の活動に統合することとなった第三国研修の追加、機材メンテナンスチーム強化活動を含めた上で、達成度を測る指標の追加・修正を行った。

2020 年 3 月、新型コロナウィルス拡大にプロジェクトは大きく影響を受けた。専門家派遣が計画通りに実施できなくなったため、プロジェクト期間を延長すると共に、非対人での研修ニーズの高まりをいち早く察知したプロジェクトチームは、当初計画にはなかった E ラーニングの検討を開始し、プロジェクト活動に取り入れることにした。PDMVer.4 には E ラーニング関連の活動を追加した。新型コロナウィルスによる影響は長期化し、2022 年 9 月に更新した Ver.5 においても E ラーニング関連の活動が更に追加された。

更に、新型コロナウィルス対策支援の一環として、掘削機等の機材を供与することとなり、機材調達支援業務と機材供与後の井戸掘削 OJT がプロジェクトの活動に追加されることになり、Ver.5 ではプロジェクト期間は大幅に延長されることとなった。

PDM Ver.5 は添付資料 2、詳細な変更経緯は添付資料 3 を参照されたい。

表 1-2：PDM 変更経緯

Ver. No.	変更年月	主な変更内容	備考
1	2017 年 11 月	• 文言の統一 • エラーの修正	
2	2018 年 7 月	• 研修業務方法書及び手順書の呼称を研修運営管理ガイドライン及びマニュアルに統一。 • カリキュラム、テキスト、教材、指導案作成マニュアルに関する記載を削除	• 実態に合わせて技術成果品の呼称を統一 • 教育省の TTLM 開発マニュアルに沿った教材作成を実施する方針を確認したため
3	2019 年 4 月	• プロジェクト期間の延長（3 ヵ月） • 研修運営管理マニュアルの削除 • 第三国研修（国際研修）を第 3 回パイロット研修として追加 • 機材メンテナンスチームの強化活動を追加 • 研修マネジメントチームを研修マネジメント委員会に呼称変更	• 第三国研修の追加及び機材メンテナンスチーム強化活動の追加に伴い期間延長が妥当と判断された • 研修運営管理ガイドラインがあればマニュアルは優先度が低いと判断
4	2020 年 9 月	• プロジェクト期間の延長（6 カ月） • プロジェクト目標の指標に 5 か年計画及び年間研修計画を追加 • E-learning の検討、ビデオ教材作成を活動に追加	• 新型コロナウィルス拡大に伴い専門家派遣が困難となった • 非対人での研修ニーズが高まった
5	2021 年 9 月	• プロジェクト期間の延長（1 年 11 ヵ月） • ハイブリッド研修の検討を追加 • 機材メンテナンスチーム強化の活動を追加 • ビジネスマネジメント強化の追加	• 新型コロナウィルス拡大に伴い、専門家派遣が困難な時期が続いた • 新型コロナウィルス対策支援の一環として、掘削機等の機材を供与することとなり、プロジェクトの継続支援が必要となった • ハイブリッド研修（対人+オンライン研修の組み合わせ）のニーズが高まった

第2章　プロジェクトの活動内容と進捗状況

2.1　業務の実施方針と方法

2.1.1　プロジェクトの基本理念とアプローチ

本案件の目的はカウンターパート機関である EWTI の研修運営管理能力の強化であり、パイロット研修の企画運営や、内部研修を組織内で持続的に実施する仕組みづくりなどを通して、EWTI の教育訓練総局の計画・管理能力の強化を図ることを狙いとした。本プロジェクトの基本理念、技術面での基本方針は、以下の通りである。

本プロジェクトにおいては、先行支援で基礎を築いた既存の技術研修のノウハウを活用する一方、EWTI がこれまでの JICA との依存的な関係から脱却し、ひとつの職業訓練機関として「自己発展的に研修運営を行う」ための支援をプロジェクトの中心的な理念とした。

技術面の方針としては、上位目標で掲げる「EWTI 教育訓練総局が持続的に水分野の人材育成を実施している」状況を常に念頭に置き、同局が必要なトレーナーの指導能力、研修運営能力、組織運営能力（図 2-1 の青色部分）を備え、自律的に財的資源（予算）・知的資源（カリキュラムや教材）・人的資源（トレーナー、スタッフ）を確保し活用する、総合的な運営管理能力の向上を目指した。また、発展的に活動を維持拡大していくために必要な、ドナーへの働きかけや対象に応じた広報活動などを行い、他機関との連携・協力を強化し、セクター全体のニーズ把握および、研修事業における協力や財源の確保に向けた働きかけなどを行った（図 2-1 の赤色部分）。

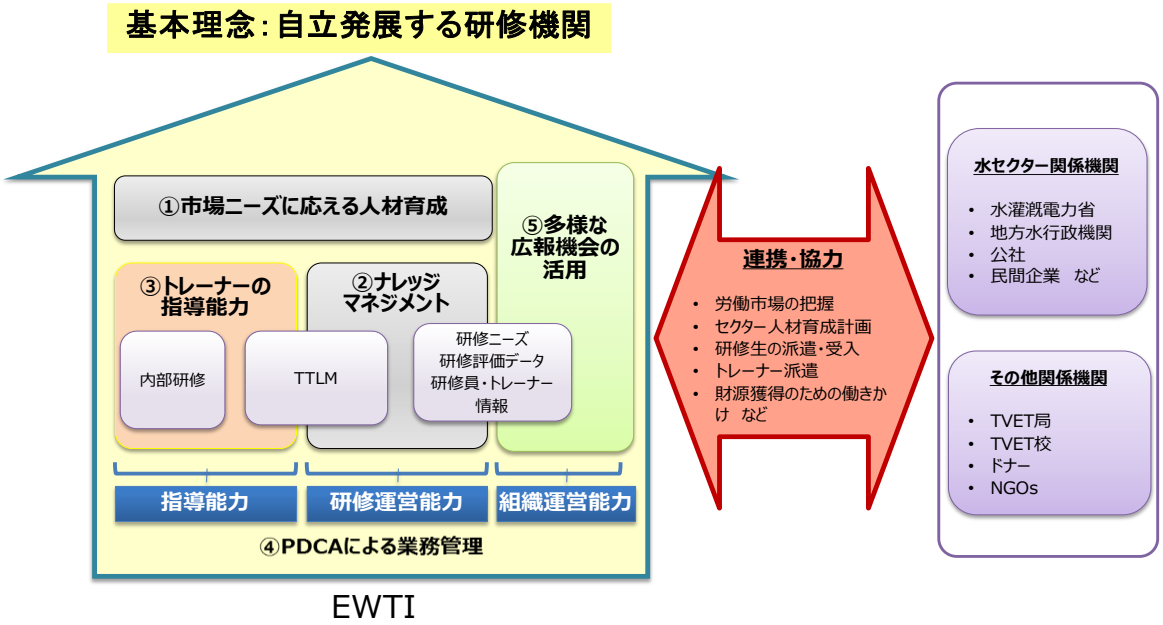


図 2-1：プロジェクトの基本方針

2.2　計画された活動内容

各成果の活動の流れと成果との関係（当初計画）を以下の図に示す。また、業務フローチャートを添付資料 3 に示す。

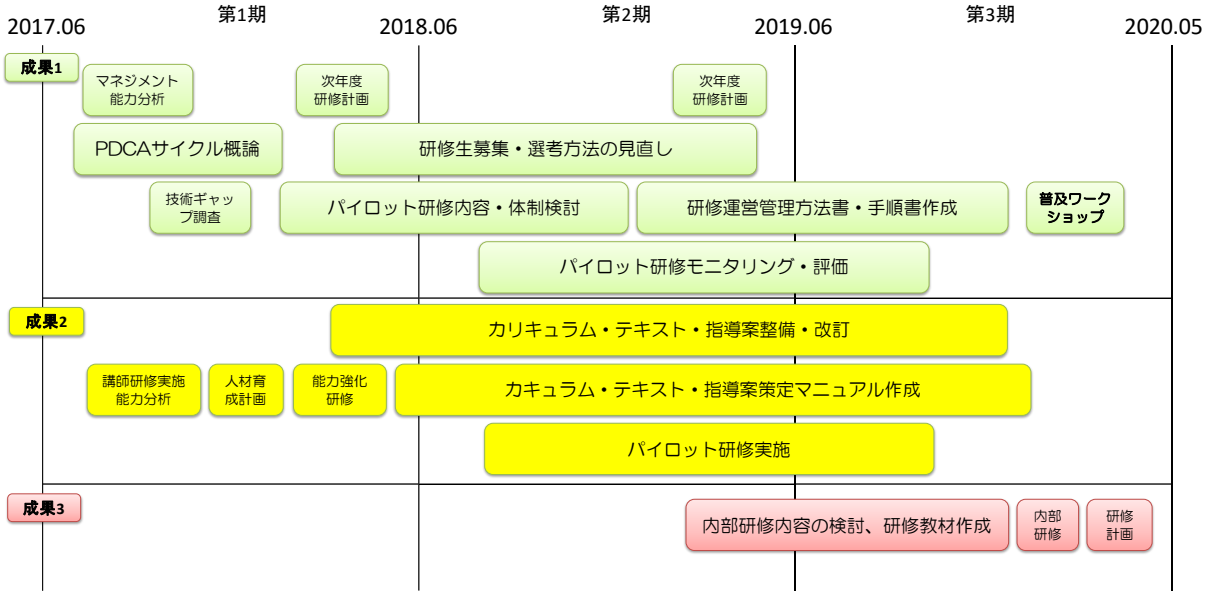


図 2-2：各成果に対する活動の流れとその関係

プロジェクトで当初計画された活動は 2020 年 3 月時点でほぼ終了したが、新型コロナウィルスの拡大やその他の外部要因により 2024 年 8 月まで延長された。

2.3　成果別活動概要と進捗

以下、成果別の成果概要とプロジェクト期間全体（2017 年 6 月～2024 年 8 月）における活動詳細の報告を行う。括弧”【 】”内の番号は、業務フロー（添付資料 4）の活動番号と対応している。PDM に基づく活動実績については、添付資料 5 に取りまとめた。

プロジェクト全体にかかる活動

2.3.1　プロジェクト全体にかかる活動と進捗状況

第 1 期～第 3 期の初めに、それぞれ業務計画書またはワークプランを作成し、JICA に提出した。第 1 期にはベースライン調査、第 3 期にはエンドライン調査を実施し、それぞれ報告書を取りまとめた。

活動詳細は以下の通り。

(1)　ワークプランの作成・改訂（【1-1】【2-1】【3-1】）

第 1 期～第 3 期、各期の初め（2017 年 7 月、2018 年 9 月、2019 年 8 月）にワークプラ

ンを作成し、それぞれ合同調整委員会（JCC）会議において、検討、承認された。

(2)　ベースライン調査（【1-2】）・エンドライン調査（【3-2】）

プロジェクトチームは、プロジェクト開始直後からベース情報の収集を開始し、第 2 回 JCC で取りまとめたベースライン情報を関係者と共有し、承認を得た後、2018 年 4 月にベースライン調査報告書を JICA 本部に提出した（添付資料 6）。

また、2023 年～2024 年エンドライン調査を実施し、ベースラインとの変化を確認した。報告書は添付資料 7 の通り。主な要点を**表 2-1** に記す。概して、EWTI はプロジェクト期間を通じて、研修コース数、研修生受け入れ数など大きな伸びを見せており、また、研修生による評価も高まっていることから、研修機関として成長を続けていることが確認できる。

EWTI が国の公益機関として独立した翌年から本プロジェクト終了の前年までの EWTI での研修コース数および受け入れ研修生の人数の推移を図 2-3 に示す。これによると、本プロジェクトが開始した 2017/18 年には 33 コースであったものが 2022/23 年には 81 コースと約 2.5 倍に増え、さらに受け入れ研修生の人数に至っては 471 人が 1499 人と 3 倍以上に増加している。また、特徴的な点として、2019/2020 年に始まったコロナ禍を契機に、NGO や UNICEF、大学などの外部からの要望に応じて実施されるオンディマンド研修の割合がコース数、研修人数共に大きく増加しているのがわかる。

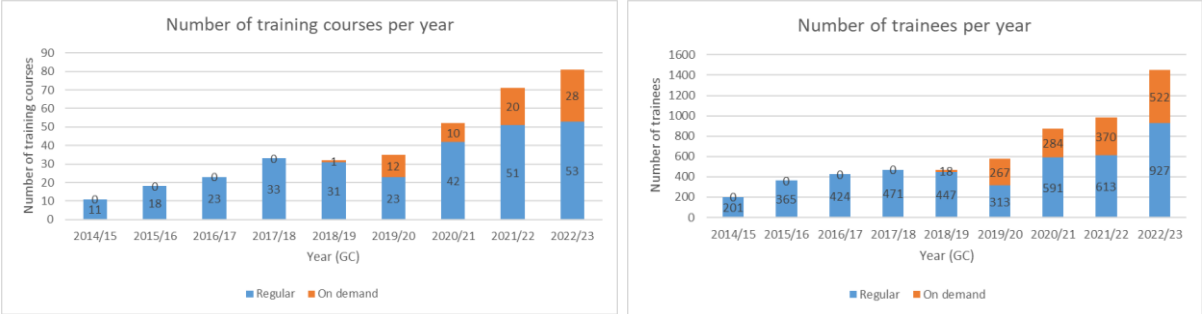


図 2-3：2014/15 年から 2022/23 年までの EWTI の研修コース数（左）と研修生人数（右）の推移

オンディマンド研修の多くは要望元の予算で実施されており、2022/23 年は EWTI で実施される研修コース数の約 1/4 がこれらの外部資金で実施されるまでになっている。図 2-4 に 2017/18 年と 2022/23 年のそれぞれで実施した研修コースの資金源の割合の比較を示す。

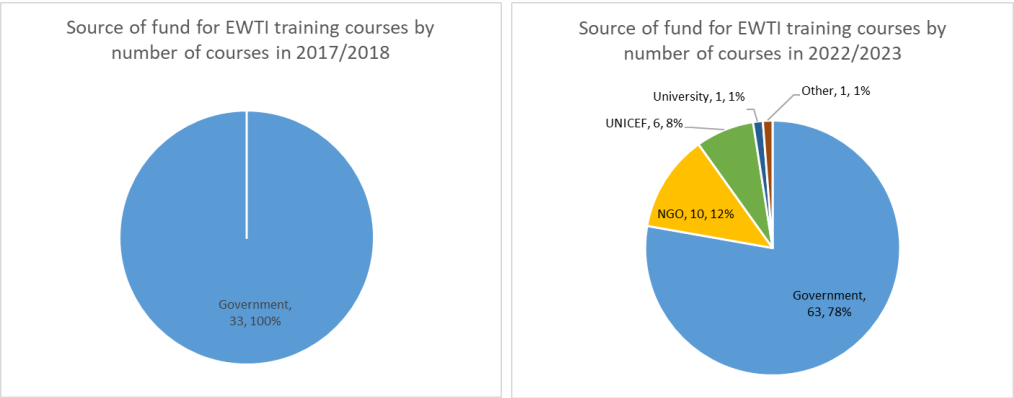


図 2-4：2017/18 年と 2022/23 年の研修コース数別の EWTI 研修の資金源の比較

各研修コースの最後に行う研修生による研修評価（2019/20～2022/23 年）においては、下図の通り、①研修で個人目標を達成したか、②研修内容の理解が高まったか、③同僚などにコースへの参加を勧めるかなど研修の満足度と質に関する質問全てにおいて増加傾向が見られた。コロナ禍を経ても、EWTI の研修への評価が高まっていることが分かる。

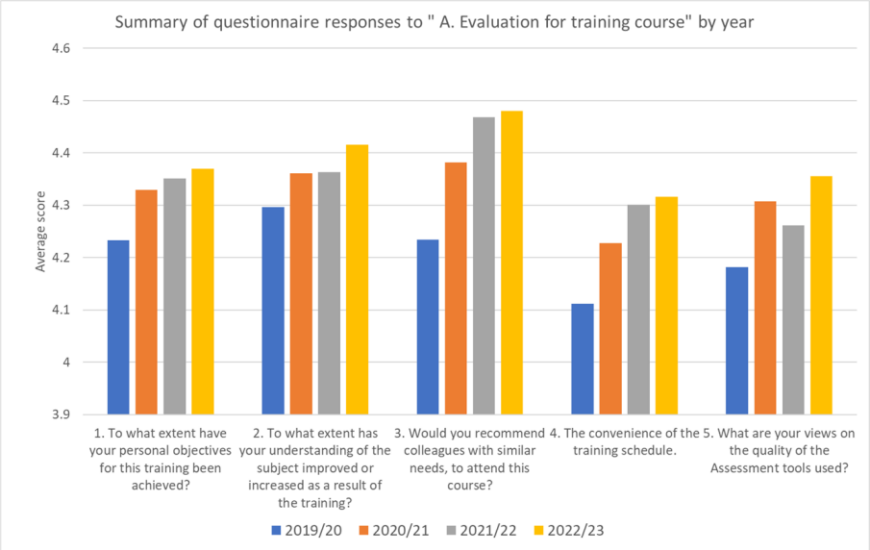


図 2-5：研修生による研修評価結果（2019/20~2022/23）

表 2-1：エンドライン調査結果要点

No.	調査項目	エンドライン調査結果要点
1	研修実績	■ 常設の短期研修コース数は 33（2017/18）から 53 コースへ増加。オンディマンドコースは 0 から 28 コースに増加。 ■ 同、年間の研修生受け入れ実績は 201 名から 1,449 名（内、オンディマンドコース受け入れは 522 名）に増加した。 ■ 新型コロナウィルス感染拡大でオンディマンドコースの需要が飛躍的に増加した。
2	研修ニーズ	■ 2017 年時点では定期的なニーズ調査は規定されていなかったが、3 年ごとの研修ニーズ調査実施を義務付けガイドラインに明記。 ■ 2020 年研修ニーズ調査を実施。

No.	調査項目	エンドライン調査結果要点
3	研修計画	■ 5ヵ年戦略計画に沿って研修計画を策定する方法に変更なし。 ■ ベースライン時は研修計画のためのガイドラインは不在だったのに対し、研修運営管理ガイドラインで研修計画策定の標準手順を明記。
4	研修予算	■ 教育訓練総局予算は ETB 7,163,000（2017/18 年）から ETB 25,510,000（2022/23 年）へ増加。年間の平均増加率は 21%だが、2017 年をベースとしたインフレ率は 2023 年で 198.25%[4] となっており、実際の貨幣価値は減少。
5	研修教材	■ 2017 年には標準化されていなかったが、研修運営ガイドラインで研修教材策定方法と手順を明記 ■ 2017 年に標準化されていなかった教材は、教育省のガイドラインで定める TTLM に準ずる EWTI 独自の TTLM に標準化。 ■ 2017 年時点で 10 年を経過した古い教材を使用していた一方、エンドライン時には全てのコースにおいて TTLM 策定を義務付け、実践。
6	トレーナー	■ 教育訓練総局職員は、計画職員数 60 名から 73 名に増加。内、在職は 31 名（ベースライン時 34 名）、43 名（同 26 名）が欠員。プロジェクト対象者は 18 名（同 18 名）。 ■ 2017 年に COC 合格証保持者は 2 名だったが、2024 年 6 月現在 32 名に増加。 ■ インストラクショナルデザインの能力自己評価結果では、研究分析、研修開発、研修実施、ナレッジマネジメント、活動管理全ての分野において能力が向上したという結果が得られた。
7	モニタリング・評価	■ 2017 年当時、プレ／ポストテストのみが実施されていたが、研修運営実施ガイドラインで、全コースに研修生の学習評価（プレ／ポストテスト、LAP テスト）を義務付け。 ■ 標準化した TTLM に研修評価のためのアセスメントツールを統合・実施中（ベースライン時には標準化した TTLM 不在）。
8	ナレッジマネジメント	■ 研修参加者のデータベースを整備（2017 年時点では不在）。 ■ 承認された TTLM の提出を義務付け（2017 年時点ではルール不在）。 ■ TTLM はプロジェクト期間中に整備したポータルサイトで保存・共有。 ■ 図書館では 2017 年当時整備不十分だった書籍の整理や電子的な文書保管などの努力を行ったが、開発途上。2024 年 6 月から変更された EWTI の新組織体制では、図書館は教育訓練総局の管轄下を離れ、広報局の管轄下となり、教育訓練総局でコントロールが難しくなった。
9	広報	■ ニュースレター発行・配布は 2020 年 3 月まで継続。 ■ 2020 年世界水の日を EWTI で開催すべく準備したが、新型コロナウィルス感染拡大により中止。 ■ コロナ禍の活動停滞、コーポレートコミュニケーション局長の辞職に伴い広報活動も停滞。 ■ SNS での広報活動はベースライン調査時と比較して活発化。
10	人材育成計画	■ 職員の研修等は政府の予算不足のため、直近 3 年程度は EWTI の独自予算による職員研修は実施されていない。 ■ プロジェクト期間中、32 名の研修トレーナーが COC（技能認定証）取得のための試験を受験し、Level3～5 の技能認定証を取得（2017 年時点では取得者 2 名）。 ■ 職員の査定は以前と変わらず 6 カ月ごとに実施される（2017 年ベースライン調査時と変更なし）。 ■ プロジェクト支援で、掘削機械整備、掘削技術、TTLM レビュー等の内部研修を支援。
11	参加者の満足度	■ 研修最終日のアンケート調査は内容を改善して継続。 ■ 研修参加者による研修評価結果（2019/20~2022/23）によれ

[4] *WorldData.info(www.worlddata.info/)*

No.	調査項目	エンドライン調査結果要点
		ば、①研修目標の達成度②研修内容の理解度③研修を同僚に勧めたいかという質問回答全てにおいてデータ集計全期間を通じて増加傾向。 ■ パイロット研修のフォローアップ調査においては、回答した全ての参加者は研修内容に満足していると回答した。

*COC: Certificate of Competency=職業訓練技能認定証。エチオピア職業標準（EOS）で定められた技能レベルに沿った技能認定試験の合格者に与えられる。

成果 1 にかかる活動

2.3.2　成果 1 の概要

成果 1 の活動では、EWTI の研修実施管理の強化を目的とした。PDCA サイクルの実践により、研修ニーズの把握、研修計画の策定と実施、モニタリング・評価という一連の活動を持続的に行うための能力の向上を目指した。特に、研修のニーズ把握や研修の実践から得られた教訓を次期の計画に活かすための体制強化を行う。第 1～2 期に実施した、第 1 回及び第 2 回パイロット研修のモニタリングを通じた研修運営管理実践の課題と教訓の抽出、各パイロット研修の教訓を踏まえた研修運営管理ガイドラインの作成と、パイロット研修を通したガイドライン内容の検証を行った。

第 3 期には、第 3 回パイロット研修を第三国であるマラウィとナイジェリアからの研修生を迎え、国際研修の運営管理も実施した。研修運営ガイドラインは第 3 回のパイロット研修の教訓を加え、Ver.3 をプロジェクトの成果として取りまとめ、最終セミナーにて印刷・配布した。

プロジェクト終了時点までに、3 回のパイロット研修の経験を基に改訂した研修運営ガイドライン Ver.3 が公式承認され、研修運営管理の方法と手順が標準化され、EWTI の全ての常設研修コースで実践されている。国際研修は準備から実施、評価に至るまでほとんどの作業が EWTI 主導で実施され、研修機関としての実績と自信につながった。ガイドラインの内容は今後も継続して実施される可能性が高いが、研修マネジメント委員会による研修コースの管理や教材の質管理等の機能が十分とは言えないことが課題として残る。

2.3.3　プロジェクト期間全体の活動報告

成果 1 にかかる活動は、以下の通りである。

(1)　研修マネジメントチームの編成（PDM1-1 関連）（【1-3】）

EWTI 総裁および教育訓練総局長と協議を行い、研修マネジメントチームのメンバー選定を行った。提案されたメンバーは 2017 年 7 月に実施した第 1 回 JCC で承認された。その後、研修マネジメントチームは 2019 年 4 月、研修マネジメント委員会（TMC）と呼称を変え、再編された。研修運営管理ガイドラインには、以下のメンバーが新規研修モジュール開設や内容の確認、研修の質を担保するためのモニタリングや評価を担うことが明記された。

表 2-2：研修マネジメント委員会（チーム）　メンバーリスト

役職名
総裁
副総裁
教育訓練総局長
計画・モニタリング評価局長
財務・調達局長
総務局長
コーポレートコミュニケーション局長
TVET 支援・コンピテンシー評価局長
総務局長
教務長
研修関連の各技術部署代表

(2)　EWTI への PDCA サイクル概論講義（PDM1-2 関連）（【1-4】）

2017 年 7 月 12～14 日に EWTI の事務管理部門職員および教育訓練総局職員を対象として PDCA ワークショップ 1 を開催し、PDCA の基本コンセプト、カークパトリックの 4 レベル研修評価[5]などについて紹介した。また、ワークショップでは、研修管理にかかる作業内容と手順の整理を行い、これら一連の作業の標準化を行う際の方向性について協議・合意した。標準化した研修管理作業項目と手順は、技術成果品である「研修運営管理ガイドライン」に反映させた。

その後、プロジェクト期間を通じて、研修運営ガイドラインの策定、教材作成、パイロット研修の計画・実施と評価、教訓の抽出と改善を繰り返し実施し、PDCA の実践を経てそれぞれのアウトプットを出していく過程が繰り返された（図 2-7 参照）。

(3)　EWTI 職員の研修マネジメント能力分析（【1-5】）

2017 年 8 月、研修マネジメントチームのメンバーを対象に、マネジメント能力（A：調査・分析、B：研修プログラム開発、C：研修実施、D：情報とナレッジマネジメント、E:活動運営管理）の自己分析を行った。全体的には、管理能力の平均値が 5 点中 3.08 と、トレーナー陣の自己評価（平均 2.65）より高い傾向が見えたが、研修実施への関与は少なく、特に上級管理職の研修への関与が低いことがうかがえた。研修マネジメントチームとの話合いでは、研修管理における重要な役割として、研修ニーズの把握と分析、研修の品質管理、研修評価、資

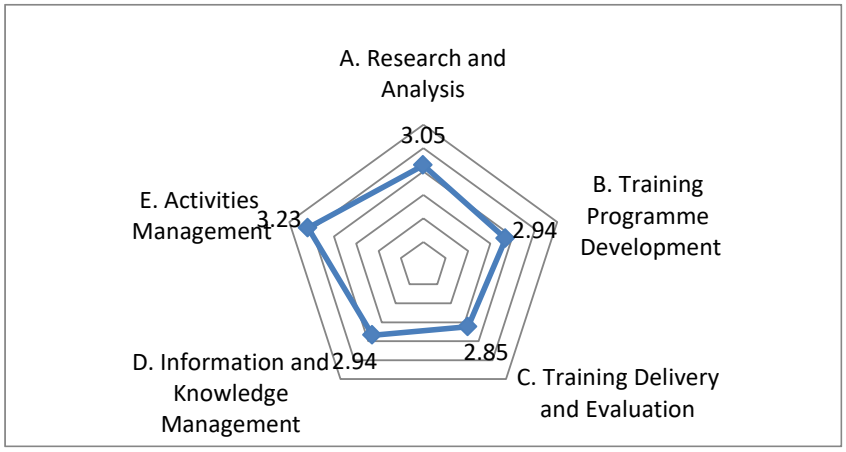


図 2-6：研修管理チームの ID 能力自己評価（5 点満点）

[5] *アメリカの経営学者カークパトリック（Donald Kirkpatric、1914～2014）が提唱した研修評価の 4 段階モデル（レベル 1：反応、レベル 2：学習、レベル 3：行動、レベル 4：結果）。研修を意味のあるものにするには、レベル 4 までの成果を求めるべきだと主張した。*

源管理、ナレッジマネジメントの強化などが重要課題として挙げられており、これらの重点課題における能力強化が必要であることが分かった。

(4) EWTI による研修需要調査の結果レビュー（PDM1-4 関連）（【1-6】）

2017 年 7 月 18 日に、前年の 11 月～12 月にかけて EWTI 職員が実施した研修需要調査の報告会を開催した。調査では、EWTI の既存のコース（および現在は実施されていない過去のコース）について、その重要性、実施時期や期間の適切性に係る情報を収集・整理した他、今後追加が望まれる新たな科目のアイデアなどが収集された。レビューにおいては、調査結果の共有のみならず、調査・分析方法に関する振り返りを行った。

本調査では、各研修モジュールがどの程度重要かという設問に対して、ほぼ全てのモジュールが「重要」という結果となり、どの程度現場で必要とされる項目なのかという分析ができなかった。また、研修内容の詳細に関する情報は得られておらず、研修内容の検討ができなかった。これらの教訓は、直後に実施された技術ギャップ調査のデザインに活かされた。

(5) 技術ギャップ調査の実施（PDM1-5 関連）（【1-7】）

2017 年 7 月から 12 月にかけて、技術ギャップ調査を実施した。調査概要は下表のとおり。本調査にかかる一連の作業は、EWTI 研修トレーナーの OJT と位置付け、出来る限りトレーナーたちの主体性と自主性を尊重して作業を進めた。調査報告書は添付資料 8 を参照のこと。

表 2-3：技術ギャップ調査概要

調査地	アディスアベバ市、ティグライ州、アムハラ州、オロミア州、南部諸民族州、ベニシャングル・グムズ州	
調査対象分野と対象機関	対象分野	対象機関
	地下水探査	州水資源局、県水事務所、水道建設公社、掘削公社、水道設計監督公社、民間会社
	掘削技術	水道建設公社、掘削公社、民間会社
	掘削機械整備	州水資源局、水道建設公社、掘削公社、民間会社
	電気機械整備	州水資源局、県水事務所、郡水事務所、タウン水道局、灌漑プロジェクト事務所
対象機関数、対象者数（合計）	39 機関、159 名	
調査対象分野	地下水探査、掘削技術、掘削機械整備技術、電気機械整備技術	
調査目的	対象技術分野における、現場での技術ギャップ[6]を把握する パイロット研修のベース情報として、現状を把握する 調査に参加する EWTI 技術者の調査・分析能力の向上を図る	
主な調査項目とデータ収集方法	調査項目	情報収集方法
	関係する各技術者の職務と各業務項目（職能）への従事頻度	質問票調査（自己申告）
	関係する各技術者の業務項目（職能）への対応能力	質問票調査（自己評価）
	関係する各技術者の業務項目（職能）にかかる技能習熟度	チェックリストに基づくインタビュー（EWTI 技術者による技能評価）
	各機関の人材育成にかかる課題	フォーカスグループ・ディスカッション、各分野技術者の直属の上司へのイ

[6] *「技術ギャップ」は、調査メンバー間の話合いで「職務に求められる能力と実際に従事する技術者の能力の差」と定義づけられた。*

		ンタビュー
	各機関の研修にかかる要望	フォーカスグループ・ディスカッション、各分野技術者の直属の上司へのインタビュー
調査員	EWTI 教育訓練総局 4 部局の技術職員（地下水開発・掘削技術部、電気・掘削機械整備部、灌漑・排水部、上下水道部）、研修オフィサー 計 15 名	

調査結果の概要は以下のとおり。パイロット研修の対象となる各技術分野における技術ギャップが抽出された。この結果は第 2 期に実施されたパイロット研修の計画に活かされた他、調査方法に関する教訓は EWTI がその後実施した研修ニーズ調査・インパクト調査のデザインなどに活かされた。

表 2-4：技術ギャップ調査結果概要

各分野の技術ギャップ	地下水探査（GI）
	・井戸掘削に関係するすべての機関に見られる技術ギャップ 井戸掘削管理 掘削施工監理の作業手順、地質に応じた掘削技術の選定、泥水管理、掘削時トラブルシューティング、井戸掘削にかかる契約書作成、井戸掘削にかかる法律や政策、掘削結果に応じた井戸デザイン、井戸リハビリ施工監理、井戸洗浄 揚水試験 データ記録および解析方法、水理常数および井戸効率の計算方法、帯水層タイプおよび適正揚水量の把握 水質 サンプル採取方法、分析結果の解釈および表現方法、水質マッピング、水質結果の要因分析、同位体分析結果の解釈、水質基準の適用 井戸検層[7] 検層データ記録方法および結果の解釈、物理探査結果との比較 主に州水資源局、郡水事務所、水事業・建設公社、デザイン・監督公社にみられる技術ギャップ 水文 水文・気象データの解釈、涵養量および水収支分析、水位分布図解釈、同位体分析 地下水探査 地質図、水理地質図、水質分布図作成、地質構造（リニアメント）分析、地質層序の理解、深層帯水層の特定 物理探査 垂直探査結果解釈、井戸検層結果解釈、水平探査結果解釈、2 次元探査、物理探査結果と地質の比較、物理探査報告書作成 地下水モデル 地下水モデルの基礎、シミュレーション結果の適用デモ
	掘削技術（DT）
	井戸掘削 深井戸掘削、泥水管理、パーカッション式掘削[8]、井戸リハビリ、揚水試験 機材メンテナンス 掘削機材（油圧系統、ハンマー、泥水ポンプ）の現場での適切な使用方法、掘削ツールスのメンテナンスのための基礎的な溶接や切断技術 地質 岩石タイプとその特徴の把握

[7] *地下の地質状況、坑井の性状などを解明するために地層の物理的情報（比抵抗、温度、放射線、電位差等）を深度に対して連続的に測定する調査手法。*

[8] *鋼製のビット（刃）を鋼索でつるし、クランク運動でビットを上下させ、坑底にビットが落下するときの衝撃力を利用して井戸を掘る方法。*

	マネジメント データ管理およびレポート作成、掘削マネジメント（チーム管理、スケジューリング、安全管理）、掘削に関する数学（泥水の粘性、密度、トルク等） シニアクラスの掘削技師は理論や計算の技術ギャップが、ジュニアクラスの掘削技師はより実技の技術ギャップが見られた。
	掘削機械整備技術（DMMT）
	トップヘッドロータリー掘削機整備 掘削機の技術仕様の理解、トップヘッドギアボックス、油圧系統、泥水ポンプ、フォームインジェクションポンプ、ウィンチの整備、掘削機のトラブルシューティング、主要パーツの分解・組み立て エアコンプレッサー 主要パーツの分解・組み立て、運転・制御システムの整備、油圧および圧縮空気循環の把握 ディーゼルエンジン エンジンオーバーホール、燃料系統整備、潤滑油・冷却システム整備
	電気機械整備技術（EMMT）
	・電気機械整備に関係する機関全般にみられる技術ギャップ ・プログラマブルロジックコントローラ（PLC）操作、水中モーターポンプのモーター整備、発電機整備、エンジン整備、ソーラーポンプ設置・整備 ・州水資源局および大規模都市の関係機関にみられる技術ギャップ ・電気機械に関する設計および仕様書作成、SCADA システム[9]、コンプレッサー整備
その他の気づき	・調査対象となった機関ごとに、求められている技能やそれに対する技術ギャップも異なる場合がある（GI および EMMT）。 ・同じ職種であっても、熟練技術者と若手技術者の間で異なる技術ギャップがある。（DT）
調査方法についての教訓	・現場の技術者の知識・技術レベルが不十分な場合、現場から得られる情報だけでは個々の技能の重要度について正しい判断ができない場合がある。 ・技術者が特定の技能を活用する頻度は、必ずしも技能の重要度と比例しない場合がある。技術者の熟練度によって与えられる業務が異なること、また、各機関で配備している機材やパーツの有無などによって、技能を活用できる機会が無いことも多い。

(6) パイロット研修内容・実施体制の検討（PDM1-7 関連）（【1-9】）

日本人専門家による EWTI トレーナーの能力分析、研修観察の結果、ベースライン調査および技術ギャップ調査の結果を基に、パイロット研修の内容・実施体制の検討を行った。研修項目の選定は、パイロット研修の目的である①研修管理能力の強化、②PDCA の実践による研修改善、③トレーナーの能力強化であることに鑑み、以下の判断基準を用いて検討した。

- 技術ギャップ調査で抽出された項目の中で、現場での優先度が比較的高い
- EWTI トレーナーが最低限の知識と技術を有していること
- EWTI または連携機関の機材と施設で対応できること
- 研修期間が長すぎたり短すぎたりしないこと（2 週間程度を目安とする）
- 既存の EWTI モジュールでカバーされている内容であること

[9] *SCADA システム（Supervisory Control And Data Acquisition の略）。産業制御システムの一種であり、コンピューターによるシステム管理とプロセス制御を行う。*
（参考：https://ja.wikipedia.org/wiki/SCADA）

(7) パイロット研修のモニタリング及び評価：PDCA サイクルを用いた研修運営（PDM1-10、1-12 関連）（【2-2】【2-5】【2-8】【3-3】【3-5】）

第 1～3 回パイロット研修は以下の日程で実施した。

表 2-5：パイロット研修分野、コース名、日程、対象者

回	技術分野	コース名	日程（研修日数）	対象者
第1回	地下水開発・管理	泥水掘削技術と掘削施工管理*	2018/10/22-11/26（20 日間）	州水資源局、地方掘削公社、水道公社、民間会社の水理地質技術者
	掘削技術			地方掘削公社、水道公社、民間会社の掘削技術者
	掘削機械整備	コンプレッサー整備	2018/10/29-11/09（10 日間）	地方掘削公社、水道公社、民間会社の機械工
	電気機械整備	発電機整備	2018/10/22-11/02（10 日間）	地方都市水道公社、郡水事務所の電気機械技術者
第2回	地下水開発・管理	掘削施工管理	2019/04/01-19（15 日間）	州水資源局、地方掘削公社、水道公社、民間会社の水理地質技術者
	掘削技術	泥水掘削技術	2019/04/08-19（10 日間）	地方掘削公社、水道公社、民間会社の掘削技術者
	電気機械整備	発電機整備	2019/02/25-03/05（10 日間）	都市水道公社、郡水事務所の電気機械技術者
第3回**	掘削技術	泥水掘削技術	2019/11/18-12/06（19 日間）	マラウィ、ナイジェリアから選定された研修生 南部諸民族州、アムハラ、ティグライ、オロミア各州掘削公社、アディスアベバ民間企業水理地質技術者
	電気機械整備	発電機整備	2020/01/21-02/07（14 日間）	マラウィ、ナイジェリアから選定された研修生 アファール、ベニシャングル・グムズ、ガンベラ、ソマリ、オロミア各州水資源局及び公社職員、アディスアベバ民間企業水理地質技術者

**地下水開発・管理分野と掘削技術分野のコースは、別々のコースとして設計されたが、共通内容が多いため合同の開催となった。*
***第３回パイロット研修は国際研修。マラウィとナイジェリアから研修生を受け入れた。*

各研修のモニタリングは、専門家による研修観察、詳細な研修記録の他、専門家の指導で導入した研修生による日例、週例のリフレクション（質問票）、トレーナーによる反省会など複数の手法を用いて実施した。詳細は下表の通り。このプロセスを経てルーティン化された研修モニタリングの方法と手順は、研修運営ガイドラインに明記され、全ての研修コースで実施されている。また、作成された日例、週例モニタリングのフォーマットは、研修運営管理ガイドラインの資料として添付されている。

表 2-6：パイロット研修モニタリング方法

No.	モニタリング・評価の方法	目的・内容
1	専門家による授業観察	研修内容が TTLM[10]に基づいて実施されているか、効果的な指導方法であるか、セルフチェック、LAP テストが実施されているかなどを観察し、問題点をその後の改善に活かした。
2	モニターによる研修記録の作成	各コースに記録者を配置し、授業内容を記録する。回を重ねるごとに TTLM の内容と実際の授業のギャップ、講義と実技の時間配分、教授法の実践などについて改善点を見つけるのに活用した。
3	受講生によるリフレクションシート（Daily Reflection Sheet）の記入	毎日の研修において受講生が①何が一番興味深かったか、②何が一番難しかったか、③コメント・提案などを記入。翌日の朝、提出されたシートの内容を参加者に共有し、必要な改善点を活かした。
4	トレーナーチームによる反省会（Daily Reflection Meeting）の実施	毎日の研修が終わった後、トレーナーチームで集まり受講生が記入した Daily Reflection Sheet を読みあげて課題を確認。必要に応じて翌日の研修の最初の 15 分補足説明などを行った。
5	トレーナーチームによる週例反省会（Weekly Reflection Meeting）の実施	研修実施中毎週金曜日に、トレーナーチームと一週間の研修の振り返りと次週の研修への改善案を導き出すための会議を行った。
6	実施関係者によるコース後レビュー会議（End of Course Review Meeting）の実施	コース終了後、研修の効果（セルフチェック、LAP テストの結果）、教材や指導方法などについてディスカッションし、トレーナー自ら改善案を導き出した。

第 1～3 回のパイロット研修の計画実践課程を通して、PDCA の考え方に基づき、振り返りと改善を繰り返した。各コースで得られた教訓や課題は、その都度詳細な内容をとりまとめ、研修マネジメント会議や JCC 会議等で関係者と共有した。また、必要に応じて教訓や課題に基づく改善に取り組み、研修管理ガイドラインや教材の改善・更新に役立てた（下図参照）。

[10] *Training, Teaching and Learning Materials = TTLM、教育省が定める職業訓練システムにおいて使用される教材の標準パッケージ。*

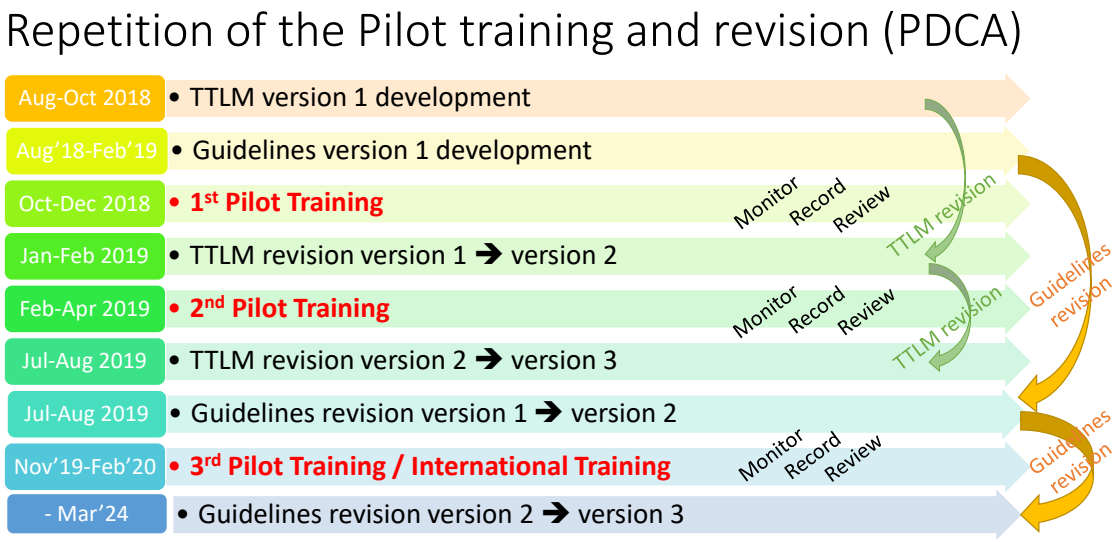


図 2-7：PDCA サイクルとパイロット研修、研修運営管理ガイドライン、教材の改訂プロセス

上記のモニタリングを通して、研修運営管理改善を行い、必要事項は研修運営管理ガイドラインに取りまとめた。プロジェクト開始時から、パイロット研修の経験を経て取り組んだ主な改善点は下表の通り。研修の基本的な考え方（学習者中心の研修）やコース運営の責任者として研修毎にコースリーダーを配置するなど、ガイドラインの骨子となる項目について、パイロット研修毎に各項目について確認し、必要に応じて改善を重ねた。

表 2-7：研修運営管理に関する主要な改善策（パイロット研修後の変化）

項目	改善策
研修の基本的考え方	■ 研修は、学ぶ側中心（Learner-centred）であり、教える側中心（Trainer-centred）ではない ■ 研修は成果重視（Outcome-based）であるべき ■ 研修は適切に管理され、管理者にモニターされるべき
コース運営	■ 研修各コースには、コースリーダーが適切に任命され、リーダーは責任をもってコース運営を行い、報告書を作成する ■ 研修運営管理の標準手続きが定められ、関係者はそれを順守する ■ 研修コース運営は、研修マネジメント委員会がモニターする
標準モジュールの導入	■ カイゼンと職場の安全と衛生に関する科目をどのコースにも統一的に導入する ■ 安全管理に関する実践を徹底する ■ 誰に対する何の研修なのか、という説明を研修コース冒頭で説明する
研修用資機材・必要物品	■ 研修で使用する機械・機材は、定期点検や整備を行い、適切に管理する ■ 研修用資機材の整備計画を策定し、予算措置を行う ■ 研修用資機材は保管場所から取り出し、研修実施前に準備する ■ 研修用資機材のオペレーションマニュアルを使用可能な状況に準備する ■ 研修で使用する機材、道具類は毎日使用前後に確認を行う

項目	改善策
研修日程	■ 研修日程は研修開始前に最終化する ■ 確定・通知後の研修日程は、基本的に変更しない
トレーナー	■ 研修を担当するトレーナーは、研修開始前に確定する ■ 外部トレーナーは、指導内容と期待される成果等について、事前に十分な説明を受ける ■ 外部トレーナーのパフォーマンスは、コースリーダーが管理する
研修管理	■ コース案内はコース内容や参加資格など十分な情報を含み、コースの 1 カ月半前までに通知する ■ 研修参加者は参加資格に基づき、所属先が責任を持って行う ■ 研修修了は、コースリーダーの責任下、試験で判定する。修了証は「合格」判定された者に授与される。 ■ 研修のモニタリング・評価は標準化された方法で実施する。

(8) 研修運営管理ガイドラインの作成（PDM1-11 関連）

研修運営管理ガイドライン及び研修運営に必要な統一書式類（フォーマット）を作成した。作成の経緯は以下の通り。2018 年にドラフトを作成してから、プロジェクト期間を通じて改訂を重ね（図 2-8 参照）、プロジェクト終了時までに Ver.3 が最終的に組織内で承認された。全文は技術協力成果品 1 の通り。

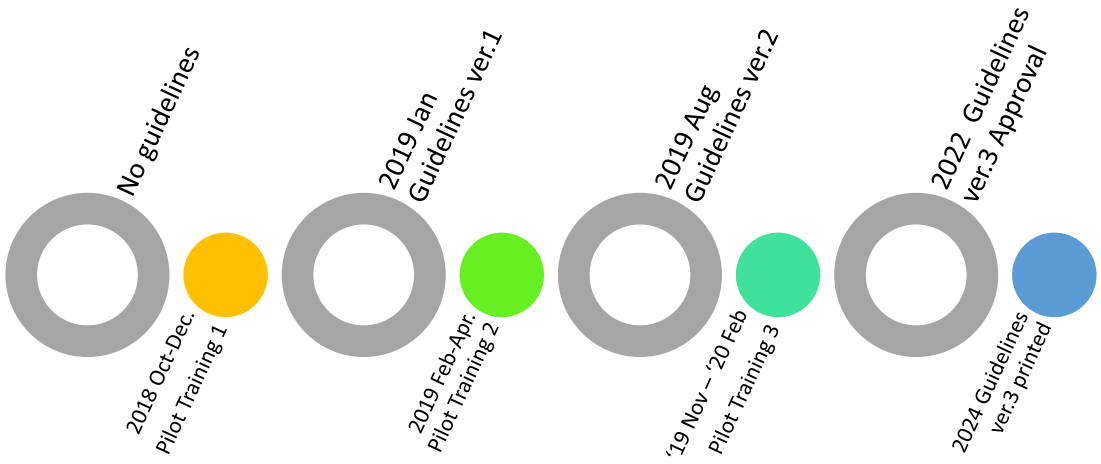
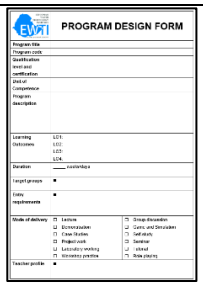
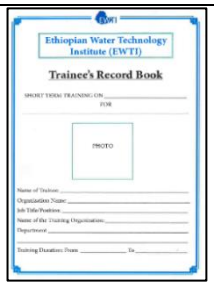
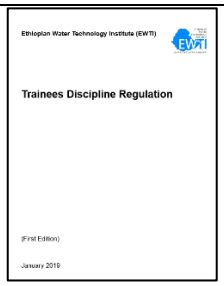
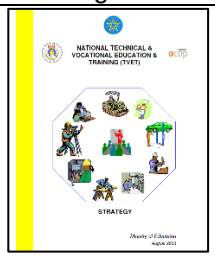
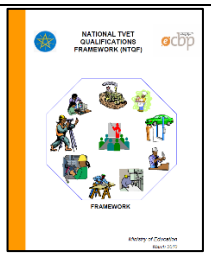
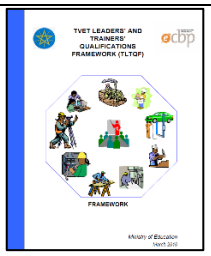
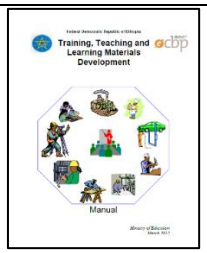


図 2-8：ガイドライン策定と更新の経緯

下表に、研修運営管理ガイドラインとその他関係資料の位置づけを整理した。研修運営管理ガイドラインは、EWTI の活動を規定する Regulation No 293/2005 に基づき、EWTI の研修運営管理全般をガイドするものであり、フォーマット等はガイドラインに規定されている研修運営管理に必要なツールとしての位置づけとし、ガイドラインの付属資料とする。研修運営ガイドラインとしては、現時点で必要な短期研修のみを対象として作成した。そのほか、教育省が作成した TVET 関連の枠組みやマニュアル類も、EWTI の研修運営管理に深く関係するため、同表に含めている。

表 2-8：EWTI 研修運営管理にかかるガイドライン、マニュアル類ほか関連資料の位置づけ

区分	公式文書			
法律文書	 Regulation No 293/2005			
ガイドライン	 Guidelines for Training Operation and Management			
フォーマット等（ガイドラインの添付書類として作成）	 Formatsfor training operation and management	 Trainee's Record Book	 Trainee's Discipline Regulation	 International Training Manual
TVET 関連文書（教育省発行）	 National TVET Strategy	 National TVET Qualifications Framework	 TVET Leaders' and Trainers' Qualifications Framework	 TTLM manual

研修運営管理ガイドライン Ver.3 の主な内容は以下の通り。

表 2-9：研修運営管理ガイドライン内容

No	章立て	内　容
1	Introduction	ガイドライン策定の背景、目的、対象範囲、EWTI における研修の特徴など
2	Principles of EWTI's Training Provision	EWTI 研修の理念、短期研修の定義、トレーニングの種類、トレーナーの資質、研修マネジメント委員会（TMC）
3	Planning and Approval of EWTI Annual Training Plan	EWTI 年間研修計画策定と承認プロセス
4	Formulation, Approval and	研修カリキュラム、教材の準備にかかるプロセ

No	章立て	内　容
	Evaluation of Training Program, Curriculum and TTLM	ス
5	Course Announcement, Selection and Admission	研修生募集、選定のプロセス、選定基準
6	Training Operation	研修実施プロセス
7	Training Assessment, Evaluation and Reporting	研修生評価、研修評価、レポーティング
8	Certification	修了証の種類、準備プロセス
9	Type of Training Related Services for Trainees	研修参加時の EWTI によるサービス全般
10	Role and Responsibility of the Different Actors	主要関係者の役割及び責任
11	Trainees' Disciplinary Issues (Annex)	研修生への規則及び罰則
12	Operational Procedures Manual for International Training (Annex)	国際研修の手引き

1) 年間研修計画の策定（PDM1-6、1-12 関連）（【1-8】【2-4】【3-4】）

プロジェクトの第 1～3 期を通して、各年エチオピア会計年度[11]の研修計画を入手し、その形式や記載内容の確認を行った。研修計画は、基本的にコース名、年間に実施されるコース別の研修回数、各研修での受け入れ可能人数、研修開始日および終了日が記載されているが、プロジェクト開始当初、実際に実施された研修の日程やコース別回数は、突発的に発生する他業務やカウンターパートの国内外での研修など、EWTI 側の都合で変更、キャンセルする例が頻発しており、研修開始数日前になって研修生に日程変更が通知されるなどの例も見られた。

プロジェクトでは、ガイドライン策定の過程において、年間研修計画の策定方法と手順を標準化し、ガイドラインに明記した。また、年間計画のフォーマットを作成し、作成方法の指導を行った。2020 年、コロナ禍で研修計画の大幅な変更を余儀なくされて以降、その実践状況がやや後退した面もあるが、年間計画策定は毎年度継続して行われている。

コロナ禍以降はオンディマンド研修の需要拡大が著しく、以前はオンディマンド研修は年間計画に含まれていなかったが、2022 年頃からオンディマンド研修も年間計画に含まれるようになった。

2) 研修生募集・選定方法の改善（PDM1-8、1-9、1-12 関連）（【1-10】【2-6】【3-6】）

研修生の募集・選定方法の改善に係る活動は、パイロット研修の計画・実施及びガイドライン策定のプロセスと共に複数回の検討・改善を繰り返した。第 1 回パイロット研修の前には、研修生募集・選定方法に関する協議をカウンターパートと行い、現状と課題を整理し、改善策について検討した。各研修の参加者に対する選定基準を設けていなかったため、レベルの異なる研修生が同じ研修参加者グループに混在していること、研修の学習成果の評価は厳密な意味では行っていなかったことなどへの反省から、インストラクショナルデザイン専門家の助言も踏まえ、以下の方針で改善していくことにした。

[11] *エチオピア会計年度は 7 月～6 月。*

- 招待状の中で、学歴、経験年数等の基準を明確にする。
- 期待される研修成果と共に、研修内容を記載した Learning Module（研修概要）を招待状に添付する。
- 招待状は従来の 1 カ月前から 1 カ月半前へと前倒しして、研修生のレベルに応じて受け入れ可否を検討する時間を確保する。
- 研修生の最終受け入れ選定は担当トレーナーが行い、研修 1 週間前までに教務課が選定結果を研修生派遣先に通知する。
- 研修生派遣機関へは、ステークホルダーフォーラム[12]を通じて、EWTI の研修生選定方針を普及する。

第 1 回～第 2 回パイロット研修のモニタリング・評価結果を踏まえ、募集要項での通知内容の改善、募集要項の早期送付、研修生選定の方法の改善などを行った。第 3 回パイロット研修までに行った具体的な試みは、表 2-10 の通り。実践を踏まえた改善点は、研修運営管理ガイドラインに反映させ、その都度改訂を行った。

表 2-10：パイロット研修を通した研修生募集・選定方法の見直し経緯

項目	第 1 回パイロット研修における改善実績	第 2 回パイロット研修における改善実績	第 3 回パイロット研修における改善実績
募集要項での通知内容	募集案内書類に募集人数の他、参加基準、研修日程と内容を記した研修モジュールを添付	研修モジュールに加え、作業服や安全靴の持参など必要な参加要件を通知（電話でも再確認）	ガイドラインに基づく募集要項内容で実践。国際研修のため JICA フォーマットに準ずる GI を作成し詳細を明記
募集要項発送のタイミング（研修開始 1 か月半前）	研修モジュール作成作業の遅れにより、研修開始 3 週間前に発送（DMMT は 4 週間前）	教務室職員不在などの理由で作業が遅れ、研修開始 25 日前に発送（EMMT）。GWDM、DT についてはそれぞれ 5 週間前、6 週間前に発送	GI は研修の 2 か月前に送付 国内研修生には通常の募集案内をガイドラインに沿って送付
募集要項発送手段	郵送（配布されるまでに数日から 1 週間程度要した）	郵送（同左）	郵送、E メール（国外からの参加者）
研修生の資格審査及び受入れ可否の連絡	電話での確認	電話での確認	書類審査、電話及びメール・電話での確認
最終受入れ確認	週明けに開始する研修の前週後半まで確認作業を継続	同左（泥水掘削コースでは 4 名の参加者が 2~3 日遅れて参加）	研修生候補者選定の結果を書面で通知（メール送信）航空券等手配終了まで電話による再確認
研修生登録	研修開始当日／1 日前	研修開始 1 日前	研修開始 1 日前

[12] *EWTI で四半期ごとに実施する関係者との会議。水エネルギー省、各州の水資源局、公社、職業訓練局、職業訓練校などの代表が一堂に会し、EWTI の研修実績の共有、協力協定の署名、方向性に関する意見交換などを行う。*

(9) ナレッジマネジメント強化（PDM 3-7, 3-8 関連）

1) 関連資料共有の仕組みづくり

第 1 期当初、トレーナーが持ち回りで新たな技術やアイデアを発表し、自由に意見交換する場である「ナレッジカフェ」と呼ばれる活動をトレーナーらが自発的に実施していて、その延長上で EWTI 職員のナレッジマネジメントへの関心が高まっていた。プロジェクトでこの動きをさらに加速するべくナレッジマネジメントを体系的に習得するための支援を研修実施管理強化の一環として行った。具体的には、2018 年 2 月～3 月、エチオピア・マネジメント・インスティテュート（EMI）よりトレーナーを迎えて、文書やデータ管理を担当する職員、および研修を担当する職員を対象としたナレッジマネジメント研修（4 日間）を実施した。また、2018 年 4 月には管理職員向けのナレッジマネジメント研修（3 日間）を実施し、管理部門の人材の理解を深めた。

このように、ナレッジマネジメントに関する意識向上と行動計画につながる研修を複数回実施した結果、2018 年 11 月に EWTI マネジメントはナレッジマネジメント・タスクフォースを内部研修チームと同じグループで担当させる方針を固め、教育訓練総局長、研修オフィサー、各技術分野のチームリーダーからなるメンバーが選定された。このように、一時期は EWTI の組織を挙げてナレッジマネジメントの向上に取り組む方向で進んでいたが、タスクフォースメンバーへのインセンティブもなく、また組織的支援が不十分であったため、職員のモチベーションも続かず、ナレッジマネジメントに関する自発的な活動はその後なかなか発現しなかった。

この状態を受け、専門家チームは IT 技術者を含む EWTI 職員に対し、ネットワークハードディスク（Network Attached Storage）を研修棟に設置し、データの共有が可能な環境を整えたほか、職員の中でもナレッジマネジメント継続の必要性への理解度が高い職員に対し、教育訓練総局のポータルサイトの作成、運営の指導を行った。サイト立ち上げ後、研修運営管理ガイドライン Ver.1 ワークショップの機会を活用し、EWTI 職員へ広くポータルサイトの紹介と使用法指導を行った。サイトでは、ガイドラインや統一書式類を初め、必要なマニュアルやツール類、TVET 関連書類、各種報告書のほか、職員の顔写真と名前、ナレッジマネジメント関係書類、関係者連絡先などが共有できるようになっている。プロジェクト終了時点で、研修管理ガイドラインと関連フォーム類に加え、合計 12 モジュールの研修教材がポータルサイトにて保存、共有されている。

2) ナレッジマネジメントに関する人的体制

ナレッジマネジメント・タスクフォースはポータルサイトの整備と関連資料共有の活動を精力的に実施し、内部研修のための研修計画、教材計画等を行った。その後、タスクフォースのメンバーの若干の入れ替えはあったものの、TTLM 改訂ワークショップ（内部研修）のファシリテーターとしてけん引するメンバーと、ポータルサイトの整備、更新を行う担当者が定着した。

ポータルサイトは、ナレッジマネジメントチームの担当者によって繰り返し EWTI のトレーナーに紹介され、トレーナーは研修資料を自分でアップロードし、更新し続けるよう奨励されたが、未だに多くのトレーナーの間で教材や研修資料はトレーナー自身のものであるという考え方が根強く、プロジェクト終了時点では定期的に内容が更新されるという

状況には至っていない。今後、ガイドラインに基づき、ポータルサイト等での教材の共有を徹底し、共有財産として管理が強化されるよう、組織的な取り組みが期待される。

(10) マネジメント能力強化（【3-9】）

第 3 期に新たに追加した活動として、ビジネスマネジメント能力強化が挙げられる。EWTI が作成し、水エネルギー省に提出した「ビジネスプラン」を近い将来 EWTI が実践することを想定し、マネジメントの基礎知識と実践能力の強化を図る狙いで、日本人のビジネスマネジメント専門家によるマネジメントスキル研修（オンライン）とビジネス実践のための基礎知識ワークショップ（対面及びオンライン）を実施した。

これらの研修は、特に EWTI のマネジメント層のビジネスマネジメントにかかる基礎知識や技術の体得に役だったが、ビジネスプランの承認後、EWTI が独立してビジネスプランを実施していくためには、更なる能力強化や人材の投入が必要と考えられる。

表 2-11：マネジメント能力強化にかかる実績概要

研修名	マネジメントスキル研修	ビジネス実施のための基礎知識 ワークショップ
日時	2021 年 6 月 29 日～8 月 25 日	2021 年 9 月 28 日、10 月 1 日、2 日、4 日
場所	オンライン	市内のホテル、オンライン
参加者	副総裁、EWTI マネジメント職員、トレーナー プロジェクトスタッフ、専門家	副総裁、EWTI マネジメント職員、トレーナー プロジェクトスタッフ、専門家
研修 実施方法	■ ビデオ教材の視聴とアサインメント提出 ■ ビデオ会議による発表・意見交換 ■ トレーナーによるオンライン指導、アサインメントへのコメント返信	■ 集合教育（ホテルの会議室） ■ 一部オンライン(Zoom)ミーティング ■ グループ活動によるアサインメントの作成、発表
主な目的	■ マネジメントの基礎知識の習得と実践能力強化（中間管理職の役割、パフォーマンス管理、部下の指導、組織能力強化、リーダーシップなど）	■ ビジネスプランの基本的知識の理解 ■ 重要フレームワークの理解 ■ アクションプランの作成を通したビジネスを論理的、具体的に実践する能力の強化
成果	■ 参加者 14 人中 8 名（57%、内 3 名はプロジェクトのローカルスタッフ）が全過程を合格点で修了。4 名参加証書（参加日数不足、アサインメント未提出など）。 ■ 参加者はマネージャーとしての心構えや指導方法、評価方法などが習得できた。	■ 出席率のみを条件とした研修修了について、15 名中 10 名（67%、内 3 名はプロジェクトのローカルスタッフ）が合格。 ■ ビジネスプランを作成するための基本的知識への理解が深まり、また、必要なフレームワークについて、体得した。 ■ アクションプラン作成を通して、組織内の業務の分析、評価、新規事業の考案・展開能力が高まった。

成果 2 にかかる活動

2.3.4　成果 2 の概要

成果 2 の活動では、EWTI の研修トレーナーの指導能力の向上を目指した。第 1 期に作成した能力強化計画に沿ってトレーナーの実技能力強化を図り、トレーナーが研修で指導できる範囲の拡大と質の向上を目指した。また、第 1 期に実施したインストラクショナルデザインの考え方を取り入れ、第 2～3 期にはパイロット研修のモニタリング・評価結果も踏まえ、効果的な研修を行うための教材（TTLM）の作成と更新・改善を行った。

トレーナーの指導能力の強化は、TTLM の作成・更新作業と共に研修の内容の絞り込み、実践的技術指導方法の改善、学習評価の方法と手順の標準化を行い、EWTI の全ての常設コースにおいて、EWTI 型 TTLM による指導がガイドラインによって規定され、実践されている。今後も TTLM による研修実施は持続される可能性が高い。

また、技術能力強化を目的に実施した研修では、トレーナーの技術能力が強化され、パイロット研修においては外部トレーナーに依存する部分が大幅に削減された。

コロナ禍で対面研修が制限されたことから、E ラーニングの手法を取り入れたハイブリッド研修（対面と E ラーニングの統合）を導入し、EWTI トレーナー数名がハイブリッド研修による TTLM レビューワークショップ（内部研修）を運営できるまでの技術を身に着けた。

プロジェクト終了後は、内部研修等を活用して個々のトレーナーが身に着けた知識や技術を組織内で共有・拡散し続けること、TTLM の更新を持続して行い、研修の質を維持向上することが重要である。

2.3.5　プロジェクト全期間の活動報告

プロジェクト全期間における活動詳細は以下の通りである。

(1)　EWTI トレーナーの研修実施能力の把握（PDM2-1 関連）（【1-11】）

2017 年 7 月、インストラクショナルデザイン[13]能力、技術能力の 2 つの側面から、EWTI トレーナーの能力把握（自己分析）を行った。インストラクショナルデザイン能力に関しては、マネジメントスタッフと同様、A：調査・分析、B：研修開発、C：研修実施と評価、D：情報とナレッジマネジメント、E：活動運営管理の 5 つの観点

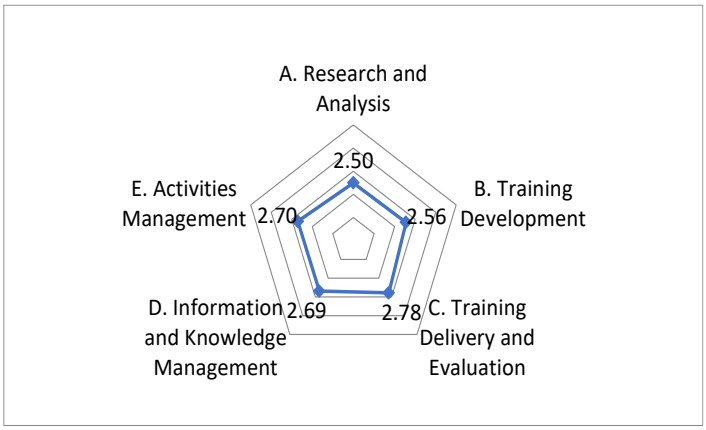


図 2-9：トレーナーの ID 能力評価（5 点満点）

[13] *インストラクショナルデザイン（ID）とは、研修の効果と効率と魅力を高めるためのシステム的なアプローチに関する理論法であり、研修が受講者と所属組織のニーズを満たすことを目指したものである(出典：鈴木克明（編著）（2004）「詳説インストラクショナルデザイン：e ラーニングファンダメンタル」NPO 法人イーラーニングコンソーシアム P0-10)。*

から、技術能力はパイロット研修 4 分野の現行研修モジュールに関する知識、技術両面の自己評価を行った。概して、トレーナーは研修実施に関しては能力が比較的高い（5 点中平均 2.78）一方、調査・分析能力、研修開発能力に関しては比較的低い（平均 2.50）ことが分かった。また、技術面に関しては、知識、技術両方の能力が不足しており、特に技術面での能力が不十分と認識しているという結果が出た。この結果を基に、人材育成計画を作成した。

(2) 人材育成計画の作成（PDM2-2 関連）（【1-12】）

第 1 期に、トレーナーの能力分析、ベースライン調査結果などを基に、人材育成計画を作成した（技術協力成果品 2）。トレーナーの指導能力の強化、実技能力の強化、研修運営能力の強化について、それぞれ活動項目とプロジェクト期間中の成果、プロジェクト後も持続が期待される成果について整理した。概要は以下のとおり。

表 2-12：人材育成計画の概要

No.	分類	活動項目	期待される成果	
			プロジェクト期間中の成果	プロジェクト終了後も持続が期待される成果
1	指導能力の強化	インストラクショナルデザイン・ワークショップ	・研修目的の整理（ガニェの 5 つの学習目標[14]） ・研修用パワーポイント改善（ガニェの 9 つの教授事象[15]）	・研修目的の明確化と実践的な研修のための内容改善
		教材改善・更新	・改善された TTLM（教材）サンプル	・教育省のガイドラインに基づく教材改善のノウハウ
2	実技能力の強化	トレーナー向けの能力強化研修（パイロット各分野）	・トレーナーの実技能力の向上・技術更新 ・トレーナーの当事者意識の向上	・EWTI トレーナーによる実技研修カバー率の向上 ・新たな研修科目の追加（例：泥水掘削[16]）
3	研修運営管理能力の強化	研修参加者の選定	・研修参加者選定基準の策定と選定方法の改善	・参加者選定改善による研修効果の改善
		研修中の学習効果測定方法改善	・プレテスト・ポストテストの内容・方法改善 ・モジュールごとの学習効果測定	・学習効果測定による研修内容の見直し・改善
		研修生の評価と修了認定の方法改善	・実技能力評価の導入 ・知識・技術評価測定に	・研修効果の測定・結果分析に基づく研修改善

[14] ガニェ（Robert M.Gagne、フロリダ州立大学名誉教授、1917～2002）は、インストラクショナルデザイン理論の生みの親。研修で目指す学習成果は 5 つ（言語情報、知的技能、認知的方略、態度、運動技能）に分類されるとした。EWTI の研修では、言語情報中心のものから、知的技能の習得を目指すものへシフトしていく必要がある。

[15] ガニェの ID 理論で提唱する「9 つの教授事象（学習を支援する働きかけ）」には、①注意喚起、②学習目標の提示、③前提条件の確認、④新情報の提示、⑤学習指針の提示、⑥練習、⑦フィードバック、⑧学習成果の評価、⑨保持確認と定着促進という人の学習プロセスに沿った外部支援の形が提唱されており、EWTI の研修においても教授法の改善にこの考え方を取り入れていく方針である。

[16] ロータリー掘削の際、ビット近くの掘削屑をスムーズに取り除くことと、掘削屑を地下深くから地上まで運び出すことを目的に泥水と呼ばれる流体を使用しながら行なう掘削方法のこと。

No.	分類	活動項目	期待される成果	
			プロジェクト期間中の成果	プロジェクト終了後も持続が期待される成果
			基づく研修修了者の認定	
		研修評価の改善	・4 レベル研修評価の導入（レベル 3、4 評価の実践）	・4 レベル研修評価によるニーズに即した研修開発・改善の実践継続

(3) EWTI トレーナーに対する能力強化研修の実施（PDM2-3、2-4、2-5 関連）（【1-13】【2-9】）

1) トレーナーの指導能力強化に関わる研修

第 1 期には合計 4 回のインストラクショナルデザイン・ワークショップを開催し、効果的な研修のための基本的な考え方の指導と、現行の研修方法の見直し、改善のための計画づくりを行った。指導能力強化の領域、インストラクショナルデザインの重要項目、研修改善の要点を表 2-13 にまとめた。

表 2-13：EWTI における指導能力強化の概要

指導能力強化の領域	インストラクショナルデザインの重要項目	EWTI の研修改善の要点（計画内容）
研修デザインの基礎要件	メーガーの 3 つの質問[17]（どこへ行くのか、到達したことをどうやって知るのか、どうやって行くのか、）	各研修モジュールに明確な到達点が設定されているか、到達したか否か、測定しているか、研修デザインを振り返る。
研修の目標設定	ガニェの学習成果の 5 分類（言語情報、知的技能、認知的方略、運動技能、態度）	言語情報中心の研修を見直し、知的技能、認知的方略を身に着けるための研修にシフトする。 運動技能、態度を身に着けるための研修方法を検討・改善する。
教授方法の改善	ガニェの 9 つの教授事象（注意喚起、学習目標の提示、前提条件の確認、新情報の提示、学習指針の提示、練習、フィードバック、評価、学習内容の保持確認と定着促進）	研修で使用するパワーポイントの改善を通して、9 つの教育事象を含む教授法改善を図る。 パワーポイント資料を活用し、TTLM の作成、更新を行う。
学習効果の測定	カークパトリックの 4 段階研修評価（反応、学習、行動、結果）	プレテスト・ポストテスト改善（内容選定、質問方法等の改善）による学習効果測定の改善 実技能力の測定による評価の導入 評価パケット*、LAP テストの作成*

*TTLM に含まれる評価ツール（Assesment Packet、Learning Activity Performance Test）

第 2～3 期には、インストラクショナルデザインの考え方に基づき、効果的な研修を行うために主に TTLM 作成・改訂の過程を通して、以下のような指導を行った。

- 学習目標を明確にし、研修コースの冒頭及び単元の冒頭で説明すること
- 研修参加者が受け身で講義を聴くだけの時間を極力削減し、自主学習と実習（Operation Sheet）に割く時間を多くとるようにすること

[17] *アメリカの教育工学研究者メーガー（Robert F. Mager）が提唱した授業設計の基本の 3 つの質問。Where am I going? How do I know when I get there? How do I get there?*

- セルフチェックや LAP テストなど形成的評価を単元ごとに入れることを徹底し、研修の効果を測定すること
- 研修評価を基に研修の修了を認定すること

上記の指導により、インストラクショナルデザインの考え方は、研修運営管理ガイドラインにも EWTI の研修理念として明記され、同書には具体的な方法と手順が記載され、今日の研修運営管理実践に活かされている。

また、上記の指導を受けたトレーナーたちについては、パイロット研修の経験を経て研修のデザインや指導能力の向上が見られた。2019 年及び 2024 年にそれぞれ実施したインストラクショナルデザインの能力評価（自己評価）では、研究・分析、研修開発、研修実施、ナレッジマネジメント、活動実施運営の全ての分野で能力が向上したという結果となっている（詳細はエンドライン調査に記載）。

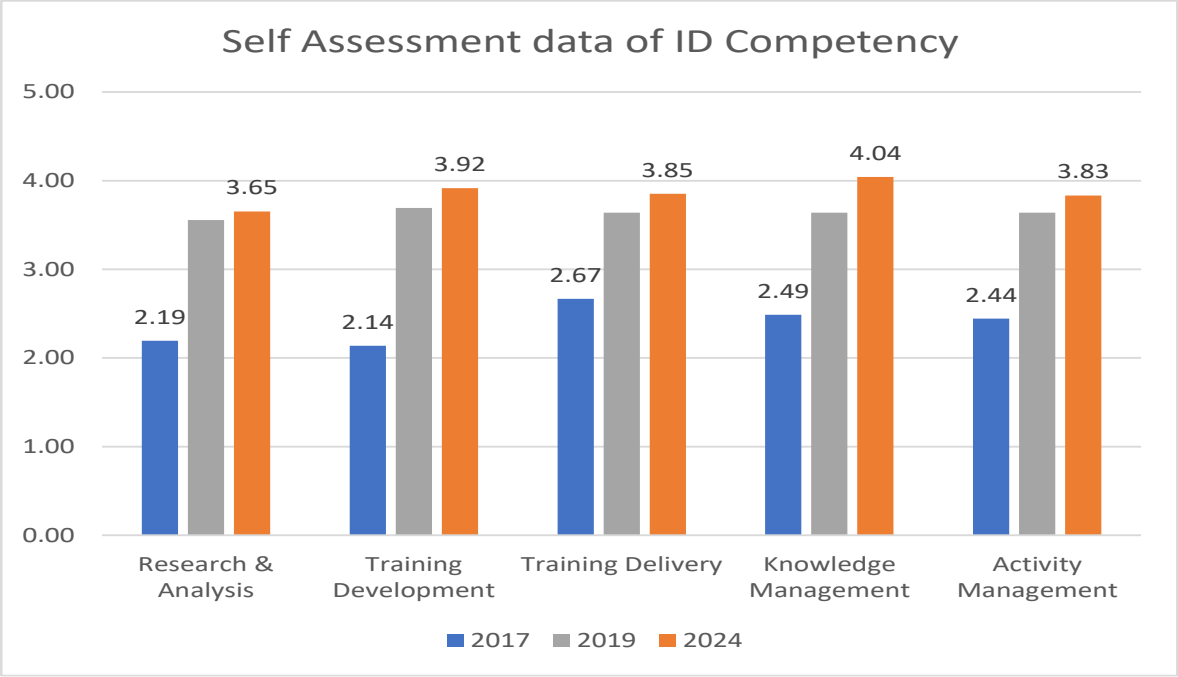


図 2-10：インストラクショナルデザイン能力自己評価結果（分野別）

Box1: インストラクショナルデザインの良さがわかった！！

地下水開発・掘削技術部門に所属するトレーナーの D さんは、「インストラクショナルデザイン」は外国で考えられた方法論で、考え方は良くてもエチオピアでの実践にはそぐわないと抵抗感を感じていた。研修中の日例、週例のレビューはなぜ必要なのか理解できなかった。第 1 回パイロット研修のレビューが終わり、第 2 回パイロット研修の準備を行っている頃だったか、D さんは「インストラクショナルデザイン・ワークショップで専門家が教えてくれたことが、やっと解った！毎日、毎週のレビューも必要なことだ！」と満面の笑顔で話してくれた。専門家の経験と技術に裏付けられた方法論の指導が、やっと実った瞬間だった。初めのインストラクショナルデザイン・ワークショップから 1 年半が経過していた。トレーナーたちの話し合いの結果、日例、週例の研修レビューは全ての研修に適用する標準手順としてガイドラインに明記された。

2) 技術の強化にかかる研修

トレーナーの能力分析、ベースライン調査、技術ギャップ調査の結果、専門家の観察などを基に、技術の強化にかかるトレーナー向けの研修を検討した。対象各分野の具体的な研修名、期間、参加者の概要を表 2-14 に記す。

表 2-14：EWTI トレーナーの能力強化研修実績（第 2 期）

No.	研修名	期間	対象者	参加者人数
地下水開発管理				
1	水質分析結果の表現方法・解釈（Geochemistry）	2018/01/24~25	GWDM トレーナー	11 名
2	揚水試験解析	2018/01/30~02/01	GWDM トレーナー	1 名
3	水収支分析、涵養量の把握手法	2018/02/19~23	GWDM トレーナー	5 名
4	GIS および Grapher を用いた地形断面図・地質柱状図作成	2018/03/19~20	GWDM トレーナー	7 名
5	地質柱状図作成と物理検層	2018/10/01~02	GWDM トレーナー	4 名
6	井戸デザイン	2018/10/03~04	GWDM トレーナー	4 名
7	揚水試験	2018/10/05,08	GWDM トレーナー	4 名
8	水質	2018/10/09~0	GWDM トレーナー	4 名
9	揚水試験解析	2019/03/13,14,28	GWDM トレーナー	2 名
10	Grapher を使用した揚水試験解析	2019/03/12~28, 2019/03/13,14,28	GWDM トレーナー	2 名
11	Grapher を使用した総合井戸柱状図の作成	2019/03/29	GWDM トレーナー	2 名
掘削技術				
12	泥水管理技術	2018/03/07~26	DT/GWDM トレーナー	7 名
13	掘削・作泥計画	2018/10/26~30	DT/GWDM トレーナー	2 名
14	泥水掘削	2018/11/01~12/4	DT/GWDM トレーナー	5 名
15	揚水試験	2018/12/07~15	DT/GWDM トレーナー・補助職員	6 名
16	揚水試験	2019/01/25~02/03	DT/GWDM トレーナー・補助職員	5 名
17	掘削のコスト計算方法	2019/04/22~24	DT トレーナー	1 名
掘削機械整備				
18	コンプレッサー整備	2018/04/12~16	DMMT/EMMT トレーナー	9 名
19	掘削機械整備	2018/06/20~24	DMMT/EMMT トレーナー	3 名
20	コンプレッサー整備	2018/08/22~24	DMMT/EMMT トレーナー	5 名
21	掘削機械整備（Schramm 製掘削機整備）	2018/09/21-22	DT/DMMT トレーナー、研究開発局及び総務局機械工	5 名
22	掘削機械整備（Schramm 製掘削機整備）	2018/09/28-30	DT/DMMT トレーナー、総務局機械工	3 名
23	掘削機械整備（YBM 製掘削機整備）	2019/10/04-11/01	DT/DMMT トレーナー、研究開発局及び総務局機械工	9 名

No.	研修名	期間	対象者	参加者人数
24	掘削機械整備（YBM 製掘削機整備）	2018/11/01-10	DT/DMMT トレーナー、総務局機械工	4 名
25	掘削機械整備（YBM 製掘削機、サービスリグ、コンプレッサー、泥水セパレーター・ポンプ整備）	2019/02/05~03/15	機材メンテナンスチーム	8 名
26	掘削機械整備（YBM 掘削機整備）	2019/03/25~04/05	機材メンテナンスチーム	7 名
電気機械整備				
27	発電機の維持管理・性能検査研修	2018/02/08~22	DMMT/EMMT トレーナー	15 名
28	発電機の維持管理	2018/02/23~27	DMMT/EMMT トレーナー	15 名
29	発電機の維持管理 TOT（TVET 教員への研修）	2018/03/08~13	DMMT/EMMT トレーナー	11 名
30	コンプレッサー維持管理	2018/04	EMMT トレーナー	
31	発電機整備	2018/10/05~19	EMMT トレーナー	3 名
32	機械ワークショップ機材設置・接続	2018/11/5	機械ワークショップ担当者	2 名
33	発電機、溶接機整備	2019/02/18~22, 2019/03/15	EMMT トレーナー	3 名

これらの研修から得られた各技術分野の具体的な成果を表 2-15 に記す。日本人専門家から直接指導を受けて身に着けた技術は、パイロット研修に活かされたほか、各トレーナーのキャリアアップにも役立ったという声が聞かれた。以前は外部人材に頼っていた実技指導を EWTI トレーナーが自ら実施できるようになり、外部トレーナーへの依存度が大きく減少した（特に電気機械整備）。各分野におけるカウンターパートの能力評価は、添付資料 9 に取りまとめた。

表 2-15：能力強化（技術）研修の主要成果

分野	能力強化研修から得られた成果の概要
地下水開発管理	■ 地質柱状図、物理検層図、井戸構造図をまとめた総合井戸柱状図の作成方法を取得し、パイロット研修で指導を行えるようになった ■ 地質柱状図及び物理検層図の比較による井戸のスクリーン位置決定能力が向上した ■ パイロット研修で、物理検層の詳細解析の指導を外部トレーナーの支援を受けながらできるようになった ■ 専門家の指導を受けながら、グラフ作成ソフトウェアを用いて揚水試験結果の解析ができるようになった ■ 専門家の指導を受けながら地下水位の低下予測を行い、適切な揚水計画及び水中ポンプ選定を行えるようになった ■ 総合柱状図作成及び揚水試験結果解析の結果を踏まえ、井戸掘削の報告書を取りまとめることができた
掘削技術	■ 専門家の指導を受けながら掘削・作泥計画の策定ができた ■ 外部トレーナーの支援を受けながら、泥水管理の実践を行った ■ 泥水掘削にかかる現場設定のデザインと実際の設定ができるようになった ■ 泥水測定、調泥の必要機材の概要と測定方法を習得した ■ 外部トレーナーの指導を受けながら、掘削工事の進行具合、切り屑の観察結果を基に調泥ができるようになった

分野	能力強化研修から得られた成果の概要
	■ 専門家の指導を受けながら、掘削工事の積算ができるようになった
掘削機械整備	■ 機械整備の基本的な考え方と一般的な整備方法と手順を理解した ■ 機械整備に必要な機材の名称、機能を理解し、基本的な使用方法を身につけた ■ 掘削機械の主要部位の解体、清掃、再組立ての作業を体験した ■ 機械整備に必要な技能リストを基に、カウンターパート各人の技能習得状況を理解した ■ 機械整備の基本姿勢を理解し、身に着けた（個人差あり） ■ YBM 製掘削機の整備体験を通し、機械整備に関する関心が高まり、整備の成功体験から、自信が持てるようになった（個人差あり）
電気機械整備	■ 機械整備の基本的な考え方と一般的な整備方法と手順を理解した ■ 機械整備に必要な機材の名称、機能を理解し、基本的な使用方法を身につけた ■ 発電機整備（消耗部品の交換、主要部位の解体・清掃・再組立て）の基本を身に着けた ■ 専門家の指導を受けながら発電機のトラブルシューティングができるようになった ■ 外部トレーナーの支援を受けずに、発電機整備研修コースを実施することができるようになった

(4) カリキュラム・テキスト・指導案の整備・作成・更新（PDM2-6、2-8 関連）（【1-14】【2-11】【3-11】）

プロジェクト開始後に、EWTI では全ての研修コースにおいて、教育省の定める職業訓練のフォーマットに則ったカリキュラム、教材の作成・更新を行う方針であることが明らかとなったため、プロジェクトチームは、教育省の職業訓練関連資料の収集とその内容の確認作業を行い、以下の方針で EWTI 側と合意した。

- EWTI では全ての研修コースについて、教育省の職業訓練のスタンダードに準ずるカリキュラムと教材を作成する。
- 職業訓練校では、TTLM の作成・使用が基準として定められているが、EWTI も TTLM のマニュアルに従って教材作りを行う。
- 職業訓練校の研修は、エチオピア職業標準（EOS）に基づくものであるが、EWTI の一部の研修コースでは EOS で規定されていないものもある（例：地下水探査、掘削機械整備）。EOS の規定がない研修に関しては、それに準ずる基準の設定と研修目標（LO）の設定を EWTI 独自に行うこととする。

当初計画ではプロジェクトの技術成果品として含まれていた「カリキュラム・テキスト・教材作成マニュアル」については、教育省が定める「TTLM 開発ガイドライン」が既に存在し、同ガイドラインを逸脱したマニュアルを作成することはできないため、プロジェクトの成果品としては作成しない方針とした。

作業実績は下表の通り。第 1～3 回のパイロット研修で教材の検証と改訂を重ね、プロジェクト終了までに対象分野のうち 2 つの研修モジュール（泥水掘削、発電機維持管理）の Ver.3 が作成された。また、多くのワークショップは、プロジェクト対象 4 分野以外の技術分野のトレーナーも参加しており、EWTI の研修の全てのモジュールにおいて TTLM を作成する方針が固まり、実践されている。

表 2-16：TTLM 作成プロセス

時期	主な活動
2018/8/27~09/05	TTLM 作成ワークショップを開催。フィリピン人の職業訓練専門家を招聘して EOS の構成と TTLM との関係、TTLM 作成手順と方法について学んだ後、執筆作業を行った
2018/09~10	各コースのトレーナーによる執筆・修正作業
2018/10/11	TTLM フォローアップワークショップを開催。フィリピン人専門家による TTLM ドラフトへのコメントと改善点指導
2018/10~11	第 1 回パイロット研修での TTLM ver.1 試行 / カリキュラム作成・教材開発専門家による ver.1 の改訂案作成作業、指導
2018/12/17~31	TTLM 作成タスクフォースによる、研修モジュール、TTLM ver.2 作成作業（共通モジュール作成、第 1 回パイロット研修の教訓の取り入れ）
2019/01~03	研修モジュール、TTLM ver.2 の修正作業
2019/02~04	第 2 回パイロット研修にて研修モジュール、TTLM ver.2 の試行
2019/05~	第 2 回パイロット研修の教訓を踏まえ、TTLM ver.3 に更新
2019/07~08	TTLM 改訂ワークショップでインストラクショナルデザイン専門家の集中インプット TTLM 改訂のための TTLM 作成 EWTI 主導の TTLM 改訂ワークショップ（内部研修）で EWTI 全コースの TTLM 改訂に着手
～2019/10	第 2 回パイロット研修の教訓を踏まえ、TTLM ver.3 に更新
2019/11~2020/02	第 3 回パイロット研修にて TTLM ver.3 の検証
2020/03~	コロナ禍での活動休止・停滞、E ラーニングの検討などの代替活動
2021/03~08	TTLM 改訂のための TTLM を改訂（パラレルワークショップ）
2021/06/11~15	TTLM 改訂ワークショップ（ハイブリッド研修、内部研修）
2021/08/26~27	TTLM 改訂ワークショップのための TOT（ハイブリッド研修ファシリテーター研修、内部研修）
2021/09/1~9,14~18	TTLM 改訂ワークショップ（ハイブリッド研修、内部研修）
2022/08/19~30	TTLM 改訂ワークショップ（内部研修）
～2024/06	TTLM ver.3 の最終化、印刷

EWTI における研修コースと研修モジュールの関係、教材（TTLM）の構成は下図の通り。詳細はガイドラインで規定されている。研修モジュール（Learning Module：LM）は、複数の学習目標（Learning Outcome:LO)から構成され、学習目標毎にラーニングガイド（Learning Guide: LG）が作成される。ラーニングガイド（LG）は、研修の内容を示す主要な TTLM の構成要素となるが、以下のような構成で作成される。単元の初めにセルフチェックで学習内容の理解度を自己測定するなど、学習者の自己学習を促すような構成となっている。

表 2-17：ラーニングガイドの構成

No.	項目	説明
1*	セルフチェック	各単元で最低限必要な知識（must to know）に関する質問集。EWTI 型 TTLM においては、まずセルフチェックを研修参加者自身が解き、クラスではその答え合わせと質疑応答から研修を始める。
2*	情報シート	各単元で最低限必要な知識をまとめたテキスト。セルフチェックはこのテキストの内容に沿って作成。
3	オペレーションシート	研修で参加者が習得する実技の方法と手順が図解等で示される。
4	LAP テスト**	実技試験問題。トレーナーはオペレーションシートで練習した内容が習得できたかを評価する。
5	参考文献等	

**セルフチェックと情報シートは、ひとつのラーニングガイドに複数含まれる。*
***Learning Activity Performance テスト：実技試験*

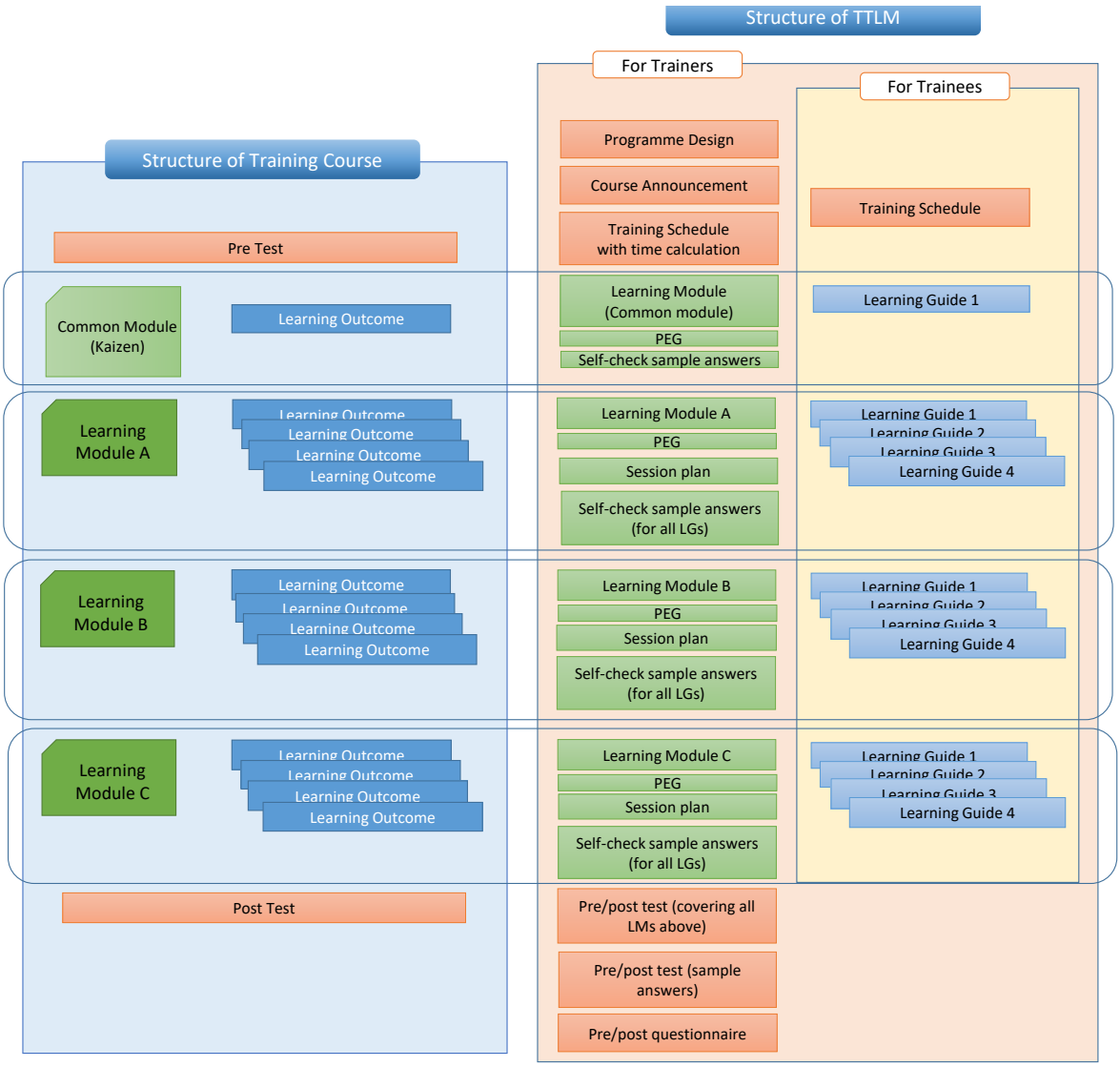


図 2-11：EWTI の短期研修コース、教材の構成

(5)　パイロット研修の実施（第 1 回）（PDM2−7 関連）（【2-10】）

2018 年 10 月～11 月、第 1 回パイロット研修を実施した。実施日程は表 2-5 の通り。計画された研修日程が度々変更される、教材などの準備が研修当日までにできていない、外部トレーナーへの指示が不十分、研修開始時間が守られていないなど管理面での課題に加え、講義が準備されていたパワーポイントの丸読みになっていた、提供する情報と参加者のレベルが合致しないなど指導法の側面でも様々な課題が明らかとなった。

(6)　パイロット研修実施（第 2 回）（PDM2−9 関連）（【2-12】）

2019 年 2 月から 4 月まで、第 2 回パイロット研修を実施した。コース準備、運営面、内容面でも第 1 回パイロット研修の経験から抽出された課題と教訓を踏まえ、多くの改善点を取り入れている。全コースにおいて、研修参加者の学習評価（LAP テスト）を徹底

し、研修内容の効率化（例：不要な内容を削除）を図った。コース別の主な改善点は以下の通り。

表 2-18：第 2 回パイロット研修で試みた主な改善点

分野	コース名	主な改善点
全分野共有		■ 情報シートごとにセルフチェック、単元ごとに LAP テストを実施することを徹底 ■ プレ/ポストテスト実施の徹底 ■ 募集要項送付前に決定した日程は変更しない方針を徹底 ■ セルフチェックと LAP テストでの合格点取得は研修の修了証発行の条件とする ■ セルフチェック、LAP テストは研修生が合格点に達するまで行う ■ 事前準備の徹底（TTLM、配布資料の事前印刷、必要機材の準備、演習現場の準備など） ■ カイゼン、OHS に関する LG を追加
地下水開発管理	井戸掘削施工管理	■ 掘削技術分野とは別グループで研修を実施 ■ 現場演習の内容の効率化を図り、研修期間を短縮 ■ 外部人材の登用回数を減らし、EWTI トレーナー主体で研修を実施 ■ 検層結果解析の演習などは、予め準備していたデータ一式を使用し、効率化を図る
掘削技術	泥水掘削	■ 地下水開発管理分野とは別グループで研修を実施 ■ 現場演習の内容の効率化を図り、研修期間を短縮 ■ 外部人材の登用回数を減らし、EWTI トレーナー主体で研修を実施 ■ 事前に掘削現場を準備し、現場演習の効率化を図る
電気機械整備	発電機整備	■ エンジンの構造詳細など不要な研修項目を縮小、エンジン以外の内容記載を追記 ■ 必要な資料の配布（配線図、整備チェックリスト） ■ 研修で使用する発電機のマニュアルを参考に TTLM の内容を改善 ■ LAP テストの評価基準を作成 ■ 現場視察先の選定（研修内容と関連する視察先を選定する）

第 2 回パイロット研修における気づきは、研修直後にとりまとめ、JCC 等で関係者と共有した。その内容は研修運営管理ガイドライン ver.2、TTLM ver.2 に反映し、第 3 回パイロット研修でその内容を検証した（主要な内容は表 2-19 の通り）。

(7) パイロット研修実施（第 3 回）（【3-10】）

第 2 回パイロット研修で抽出した課題と教訓を踏まえ、2019 年 11 月～2020 年 2 月第 3 回パイロット研修を実施した。第 3 回パイロット研修は、当初 JICA エチオピア事務所が計画・実施予定となっていた第三国研修をプロジェクトと連携し、国際研修を実施することとなった。マラウィとナイジェリアから研修生を招き、加えてエチオピア国内からの研修生を迎えて実施した。研修案内（GI）作成、研修生選定、渡航手配、宿泊先や日常生活の支援など、国際研修に必要な一連の作業は EWTI 側が主体となって実施した。第 2 回パイロットプロジェクトからの主な改善点は表 2-19 の通り。第 2 回パイロット研修から更に TTLM を改善し、LAP テストによる評価方法の明確化や内容のスリム化を徹底した。

表 2-19：第 3 回パイロット研修で試みた主な改善点

分野	コース名	主な改善点
全分野共有		■ TVET の方法を一部取り入れながらも、成人教育に適した EWTI 独自の研修方法を標準化。 ■ 全ての研修をモジュール化。 ■ 全ての研修モジュールに共通の方法と手順を適用。特に「セルフチェック・ファースト」の方法を採用し、トレーナーの講義からではなく研修参加者の自主学習を促すセルフチェックから単元を開始することを推奨。 ■ LAP テストの評価方法を明確にするため、全ての学習目標（Learning Outcome）に一つずつ実技評価ガイド（Performance Evaluation Guide: PEG）を作成。PEG には、LAP テストの際の実技テストにおける指示内容、口頭試験問題と模範解答が記載されている。 ■ 従前の方法ではプレテスト、ポストテストは研修参加者の評価に反映させないことにしていたが、LAP テストを補完する知識試験の一環として、ポストテストの結果を研修修了認定に加算。 ■ 全コースの共通モジュール（カイゼン、OHS、チームワーク）を採用。
地下水開発管理	井戸掘削施工管理	■ 研修モジュールに含む内容が多すぎる。1 モジュールとして取り扱う内容の集中と選択。 ■ Information Sheet に記載された内容量が膨大。テキストの内容とその他のハンドアウト（資料）に分けるなど、TTLM の内容を改善。 ■ ソフトウェアの使用方法を指導するためのマニュアルを配布。 ■ 解析に必要なデータのセットは TTLM の内容に含める。
掘削技術	泥水掘削	■ 泥水測定の試験方法（LAP テスト）を改善（全員ほぼ同じ数値の出てくる現場で測定されたデータではなく、あらかじめ用意されたサンプルまたはデータを基に調泥方法を考えさせる内容とする）。LAP テストは、演習現場ではなく、EWTI コンパウンド内で実施。 ■ 現場実習では、講義の時間を短縮し、演習の時間を増加。 ■ 掘削機械（LG2）の LAP テストに機械の操作（実機）を追加。
電気機械整備	発電機整備	■ 研修前の質問票調査の実施を徹底する（第 2 回研修では未実施）。 ■ LAP テストは研修修了の前日までに実施する。 ■ TTLM に記載されていない内容が研修に含まれたので、TTLM に沿った研修を実施するよう改善する。 ■ セルフチェックの設問を改善（記述式回答を求める設問が多すぎた） ■ LAP テストを改善（評価のためのチェックリストを作成）。

第 3 回パイロット研修では、3 コースの開催を検討していたが、井戸掘削施工管理の分野は対象となる参加者が高学歴で熟練の人材が想定されており、トレーナー側の高度な知識や技術と豊富な経験を必要とされるのに対し、EWTI 側のトレーナーの経験値が低く、TTLM の準備進捗も芳しくなかったことから、国際研修の対象からは外されることになった。

第 3 回パイロット研修で抽出された改善点は、第 1 回、第 2 回同様研修運営管理面の課題、技術研修における課題としてとりまとめ、それぞれ研修運営管理ガイドライン Ver.3、TTLM Ver.3 に反映され、それぞれ最終化された。国際研修実施管理方法と手順は、ガイ

ドラインの添付資料として国際研修マニュアルとして取りまとめた。

(8) E-ラーニング（ハイブリッド研修）の導入検討

第 3 回パイロット研修終了直後に、全世界的に新型コロナウィルスの拡大が深刻となり、現場での活動が停滞した。プロジェクトでは、コロナ禍の新たなニーズに応える研修の新しい形の必要性にいち早く気づき、オンラインの学習管理システム（LMS）を活用した非対面の研修方法について検討を行った。

一足飛びにオンライン研修の実施を目指すのは環境的にも能力的にも不十分と考えた専門家チームは「ハイブリッド研修」を提案し、対面型とオンライン学習を組み合わせた研修を試行し、カウンターパート側の高い関心を得た。TTLM 改訂の作業をハイブリッド研修の方法を用いて実施し、下表の TTLM の改訂作業を支援した。

表 2-20：改訂が行われた研修モジュールとパイロット研修対象の有無

EWTI 内の担当部署	改訂の対象とした研修モジュールタイトル	パイロット研修の対象有無
水資源開発管理・掘削技術	掘削施工管理 (Supervision of Water Well Drilling and Development)	○
	GIS・リモートセンシング (GIS and Remote sensing for Water resource management)	×
	泥水掘削工法	○
上下水道	水道工学とソフトウェア・アプリケーション (Water Supply Engineering with Software Application)	×
	無収水管理 (Non- Revenue Water Management)	×
電気機械整備	発電機維持管理 (Operating and Maintaining a Gen-set)	○

内部研修として実施した TTLM 改訂ワークショップは、トレーナーたちの関心が高く明確な効果が表れたため、ハイブリッド研修による内部研修のファシリテーションの方法の技術移転に力を注いだ。TTLM for TTLM は当初、オープンソースの学習管理システム（LMS）の Moodle を活用して実施したが、Moodle の継続活用には有料のサーバー契約が必要とされ、EWTI の現行の体制及び予算措置上の問題があるため、無料で使用可能な Google Classroom による E ラーニング教材のプラットフォーム構築方法を指導した。今日までに、発電機維持管理コースを含む 3 コースの研修モジュールがオンライン環境に装備され、一部のテストが実践で施行された。

また、オンラインでの TTLM 教材を補填するための動画教材の作成方法を指導した。YouTube を活用して、学習の補助教材として活用できるよう、指導を行った。さらに、このようなオンライン上のコンテンツ配信については、情報セキュリティや著作権の課題に対応する必要があるため、活用方法のガイドライン案を作成し、EWTI 管理者の業務内容について合意した。ただし、EWTI マネジメントは個人アカウントの使用が制限しきれな

いこと、組織としてアカウントを持続的に管理できる体制が不十分なことなどを理由に、YouTubeを組織としての管理することは困難と考えており、積極的なビデオ教材の管理への取り組みは実践されていない。Google Classroom の教材にビデオ教材をリンクする方法を指導し、一部のトレーナーが実践しているにとどまる。

成果 3 にかかる活動

2.3.6　成果 3 の概要

成果 3 の活動では、EWTI が持続的に内部研修を行い、組織人材の能力の維持向上、技術更新を図るための仕組みづくりを目指した。第 1 期には「内部研修」の定義を「業務遂行上必要と判断される EWTI 職員の能力強化のための研修」とすることをカウンターパートと定めた。第 2 期には、内部研修チーム／ナレッジマネジメント・タスクフォースを設置し、研修内容や方法の検討を行った。第 3 期にはプロジェクトで能力強化研修を受けたトレーナーらが内部研修（自主トレーニング含む）を実施し、次期の活動計画に内部研修を統合するよう促した。残念ながら内部研修の統合された年間計画はこれまでのところ作成されていない。

また、組織として研修事業を運営するために不可欠な研修用機材のメンテナンス強化を図るため、機材メンテナンスチームを設置し、持続的な機材の維持管理体制の強化を支援した。具体的には、掘削機械点検整備の OJT などを通して、メンバーの技術強化を図ったと同時に、メンテナンスシートを用いた機械の定期点検・整備活動の実施を支援した。プロジェクト終了時現在、機材メンテナンスチームの個々人の技術は向上が見られたものの、メンテナンスチームとしての機能や EWTI マネジメントによる組織的な支援体制は不十分で、定期点検整備は 2022 年 11 月以降、実施されていない。2024 年 6 月に非公式ながら運用開始した EWTI の新体制においては、機材の維持管理を含む責務を各技術の研修・コンサルタント部門に課しており、組織としての今後の取り組みに期待したい。

2.3.7　プロジェクト全期間の活動報告

成果 3 の活動は以下の通りである。

(1)　内部研修チームの編成（PDM3-1 関連）（【2-13】）

内部研修チームの編成については、R/D で暫定的に合意されているが、研修マネジメントやナレッジマネジメントなど異なるタスクに重複して多数の委員会やグループを設置しても実態を伴わないという判断から、内部研修チームとナレッジマネジメント・タスクフォースは同じメンバーで編成することを専門家チームが提案し、第 5 回 JCC 会議で合意された。

(2)　内部研修の実施（PDM3-2~3-6 関連）（【2-14】【3-14~16】）

1)　TTLM 改訂ワークショップ

パイロット研修の準備、実施のプロセスを繰り返す中で、TTLM 改訂の活動を EWTI 主

導で定期的に実施する方針が固まってきた。プロジェクトでは主に第 3 期中に、内部研修として EWTI が研修運営管理ガイドラインに定める研修教材の年一回のレビューと改訂作業を実践するための支援を行った。その定着を図る一つのツールとして、内部研修用の「TTLM 改訂のための TTLM(TTLM for TTLM)」を作成した。活動はコロナ禍でも継続され、週例のオンラインワークショップを通して、また、2021 年 6 月にはパラレル・ワークショップと称して、日本とエチオピアで同時開催のワークショップを運営し、教材作成を進めたほか、教材は、2021 年 8 月に E ラーニング教材として学習管理システム（LMS）の Moodle 上にアップロードし、同 9 月にハイブリッド研修方式で内部研修を実施するに至った。

プロジェクト終了時、EWTI の全てのコースにおいて TTLM 作成と年一回のレビューがガイドラインで義務付けられ、おおむね全ての研修コースで実践されている。

表 2-21：TTLM 改訂に関する内部研修実績

No.	年月・期間	研修名	対象者	内容・備考
1	2019/8 (10 日間)	TTLM/ガイドライン作成ワークショップ	マネジメント、トレーナー、教務課職員等　37 名	成果 2 で専門家が実施した同様の研修を EWTI 側主導で実施した。
2	2019/10 (3 日間)	TTLM ワークショップ	マネジメント、トレーナー　39 名	・TTLM 改善（7 分野） ・ガイドラインの標準化 ・研修経験の共有
3	2019/10 (1 日間)	TTLM ワークショップ(DT)	教育訓練総局長、トレーナー 5 名	
4	2019/11 (1 日間)	TTLM リハーサル(DT)	DT トレーナー3 名	
5	2021/3-8 (計 16 回)	TTLM for TTLM 改訂 （オンライン）	EWTI トレーナー（ファシリテーター）4 名	・TTLM for TTLM 改訂 ・ファシリテーター役のトレーナー能力向上
6	2021/6 (5 日間)	TTLM 改訂ワークショップ（ハイブリッド研修、日本とエチオピアで遠隔実施）	EWTI トレーナー（ファシリテーター）4 名	・TTLM for TTLM 改訂 ・TTLM 改訂ワークショップの詳細計画作成
7	2021/8 (2 日間)	TTLM 改訂ワークショップのための TOT （対面）	EWTI トレーナー（ファシリテーター）4 名	・TTLM 改訂ワークショップのためのセッションプラン及びスケジュール作成 ・Moodle、Zoom 使い方確認
8	2021/9 (14 日間)	TTLM 改訂ワークショップ（ハイブリッド研修）	EWTI トレーナー5 コース 9 名、ファシリテーター（トレーナーから選定）3 名	・研修生の TTLM 作成・改訂にかかる能力強化 ・対象コースの TTLM Ver. 3 の改訂 ・ハイブリッド研修の試行
9	2022/8 (12 日間)	TTLM 改訂ワークショップ（ハイブリッド研修）	EWTI トレーナー 15 名（8 モジュール対象）、ファシリテーター3 名	・全 8 モジュールが TTLM 最新バージョンの内容を最終化、オンライン提出 ・TTLM 改訂・最終化のスキル、ファシリテーターの関連指導スキル強化 ・Zoom の操作スキル強化 ・ファシリテーター能力強化 ・Google Classroom の操作スキル強化

2) ナレッジマネジメントに関する内部研修

ナレッジマネジメントに関する内部研修の研修実績は下表の通り。ポータルサイトでは 14 の研修モジュールの教材が管理されている。同サイトにおける研修教材の管理を徹底し、活用の活性化を図ることが期待される。

表 2-22：ナレッジマネジメントに関する内部研修実績

No.	年月・期間	研修名	対象者	内容・備考
1	2020/8	ナレッジマネジメント活動計画	教育訓練総局長、EWTI トレーナー 7 名	ナレッジマネジメント委員会再編成、活動計画策定
2	2022/9 (半日)	データマネジメント研修	ナレッジマネジメントチーム、IT 担当、教務課職員、その他　計 7 名	EWTI 研修生記録の蓄積、集計、分析
3	2022/9 (半日)	ポータルサイト運用ワークショップ	総裁、副総裁、局長、ナレッジマネジメントチーム、トレーナー、IT 担当、研修支援担当 計 13 名	ポータルサイト導入意義を共有、共有情報の理解促進、管理方法（編集、閲覧権限の範囲）、管理責任者決定、サイト利用方法の理解促進

3) 技術強化研修

技術分野の内部研修は、主に機材メンテナンスチームの OJT として実施されたため、下記の機材メンテナンスチーム強化の項に成果と課題を記した。専門家の指導の下、電気機械整備分野では、以下の内部研修が実施された。同分野のトレーナーが実施した発電機維持管理研修においては、外部トレーナーへの依存度が 16.67%（ベースライン）から 0%（第 3 回パイロット研修）に減少した。

表 2-23：電気機械整備分野の内部研修実績

No.	年月・期間	研修名	対象者	内容・備考
1	2020/02 (4 日間)	発電機実験装置の取り扱い・指導時方法	EMMT トレーナー6 名	発電機実験装置の取り扱い、指導方法
2	2020/03 (2 日間)	コンプレッションゲージ使用方法	EMMT トレーナー1 名	コンプレッションゲージの使用方法指導

4) 井戸掘削 OJT

2022 年 10 月に供与機材として調達した車載型掘削機等を活用し、井戸掘削の OJT を実施した。EWTI の掘削チーム及び地下水探査チームを対象に、2023 年 1 月 25 日から開始された井戸掘削 OJT は、主に掘削機械の不具合、2023 年 12 月に起きた孔壁崩壊・押出しによる掘削ツール類の抑留事故が要因で、予定した工期を大幅に延期せざるを得ず、2023 年 2 月、井戸掘削・建設が完了した。本 OJT から新たな掘削チームのメンバーも含

めEWTI掘削チームは、比較的高深度の井戸掘削を体験することにより、掘削機械の操作、泥水管理、トラブルシューティングから実践的な技術向上を図ることができた。

井戸掘削・建設にかかる詳細は添付資料 12 の完工報告書の通り。掘削した井戸は深度260m、毎秒 5.5L の揚水が可能。完成した井戸は EWTI 構内の水源として使用されている。

(3) 機材メンテナンスチーム強化（PDM3-9, 3-10 関連）（【3-17】）

2019 年 2 月、EWTI 総裁のイニシアチブで「機材メンテナンスチーム」が結成された。このチームは日本人専門家の指導を受けるために暫定的に結成されたものであるが、研修用機材が適切適時に用途を足さないことが多く、予防的なメンテナンスや定期的な手入れが欠かせないことから、同チームに継続的に機材メンテナンスの責任と業務を担わせる仕組みづくりを目指した。

チームは教育訓練総局を含む、主に機械分野での知識と技術を有する混成のチームで、メンバーは総裁が任命した。同チームの TOR（添付資料 13）は EWTI マネジメントと専門家チームがドラフトし、2020 年 10 月に最終化された。チームは、機械類の整備計画作成、定期点検・整備を初め、機械類が研修で必要な時にいつでも整備されている状態に維持されることをその職務とし、EWTI は消耗品や交換パーツなどが適切適時に提供されるようにする義務を負う。

プロジェクトでは研修に必要な機材の定期点検をルーティン化するための支援を行った。専門家の支援で作成した点検用のチェックシートを用いて、それぞれの機材担当が月に一回の点検を行い、記載したチェックシートを教育訓練総局へ提出するという方法が採られた。EWTI 側マネジメントには、定期点検実践のモニタリング実施を促し、モニタリングシート提出状況をチェック表で確認する方法などの指導を行った。マネジメントに促されたチームメンバーは 2～3 ヵ月間は点検作業を行うものの、継続しなくなってしまうということが続いた。加えて、点検結果をマネジメントが確認した後、必要な部品の交換や修理といった対応が予算不足や財務局の協力不十分などの理由で実施できず、メンテナンスチームのやる気を削ぐ結果となってしまった。

教育訓練総局長初めマネジメント層は、機材メンテナンスチームのメンバーと複数回の話し合いの機会を持ち、定期点検の継続の必要性を確認し、継続のための対処方針について意見交換を行い、事態の改善に向けた努力が行われた。

プロジェクトチームも忍耐強く働きかけを行ったが、プロジェクト終了時において、メンテナンスチームによる定期点検・整備が定着した状況になったとは言い難く、必要に応じて不定期な点検・整備が実施されている状況にとどまった。

プロジェクト期間中、専門家の指導の下、機材メンテナンスにかかる以下のような内部研修が実施された。メンバーは下記の研修を通して、実機を使用した分解、点検、再組立てなどを繰り返し、機械の点検・整備にかかる実践の機会を積むことができた。熟練の専門家の手元を見ながら作業することで、「勉強になった」という多くの声が聞かれた。組織的な実践機会の創出とインセンティブの確保がなされ、これらの技術職員が内発的な動機から機材の維持管理を行うことができるような体制が整えられることを期待したい。

表 2-24：機材メンテナンスチーム対象の研修等実績

No.	年月・期間	研修名	対象者	内容・備考
1	2019/10 (2 日間)	発電機メンテナンス	EMMT トレーナー 9 名	実機を用いたトラブルシューティング
2	2019/10-11	掘削機械整備	EMMT トレーナー、掘削チーム	YBM 掘削機整備
3	2020/2-3	掘削機整備	機材メンテナンスチーム、掘削チーム　9 名	YBM 掘削機整備
4	2020/3 (半日)	機材メンテナンスチーム活動内容の検討	マネジメント、機材メンテナンスチーム　7 名	日常点検票、マニュアル類整備にかかる話し合い
5	2020/9 (2 日間)	発電機の日常点検、ディーゼルエンジンの点検整備	機材メンテナンスチーム　9 名	発電機日常点検方法、点検用フォーマット、エンジン点検・整備
6	2020/10	機材メンテナンスチーム TOR 作成	教育訓練総局長、EWTI トレーナー 7 名	機材メンテナンスチーム TOR 作成、（ドラフトの）最終化
7	2022/3-4	掘削機整備	機材メンテナンスチーム　8 名	YBM 掘削機整備

本邦研修･招へい

2.3.9　本邦研修、招へい

プロジェクト期間中、3 グループの本邦研修と 1 グループの招へいプログラムを実施した。概要は下表の通り。どのグループも、日本の高い技術のみならず、その発展の歴史や技術者の業務姿勢を学び、自国での技術発展や人材育成の重要性を再確認して帰国した。エチオピアに帰国後は、それぞれ日本で得た知見や研修及び招へい期間中に作成した行動計画を EWTI 内で発表する機会を設け、組織内での情報共有を行った。多くの参加者に帰国後の業務取り組み姿勢にポジティブな変化が見られた。

表 2-25：本邦研修、招へい実績

日程 対象者	目的	主な内容	成果
2018/05/17~29 EWTI マネジメント （4 名）	自国・EWTI における研修運営上および技術上の問題点を包括的に整理し、日本での研修成果を活用して、エチオピアの水分野技術者の人材育成に貢献する。	日本の水道事業体、研修機関等訪問（東京水道局、日本水道協会、高専、掘削会社） ID 概要（熊本大学） JICA 本部と協議	参加者は全員高い関心を持って研修に臨み、エチオピアへ帰国後は報告会を行って日本で得た知見を組織内で共有したほか、世界水の日のセミナーでは日本水道協会の人材育成の取り組みをエチオピアに取り入れる提案を行った。
2019/08/25~09/07 地下水開発・掘削分野トレーナー （3 名）	日本人技術者の業務姿勢や現場業務を学び、地下水探査及び掘削の機器やメンテナンス方法に係る知見を得る。	物理探査機器操作 掘削工法、泥水管理、掘削ツールスや井戸スクリーンに係る視察、講義、演習	日本の高い技術や技術者の情熱、仕事への取り組み姿勢を高く評価し、帰国後に「カイゼン」の実践をするなどトレーナーの姿勢に変化が見られた。

2019/08/25~09/07 電気機械分野トレーナー（5名）	日本の電気機械に関する技術や技術者の取り組み姿勢、ワークショップ運営について知見を得る。	コンプレッサー整備、発電機点検・整備、油圧システム、ワークショップ運営にかかる視察、講義、演習	研修成果を発表し、学んだ技術や行動計画を組織内で共有した。
2019/09/29~10/5 水エネルギー省副大臣 EWTI マネジメント （4名）	EWTI の組織としての自立の重要性、収入活動実現の必要性を認識し、政府高官のコミットメントを促す。	水道事業に係る人材育成・研修視察（東京水道局、横浜ウォーター） ID 講義、研修機関視察（熊本大東京事務所、高度ポリテクセンター） JICA 本部協議	参加者は日本の技術や研修管理に高い感銘を受けた。 帰国後、副大臣による収入活動へのサポートが得られた。

プロジェクト管理にかかる活動

2.3.10 プロジェクト管理にかかる活動報告

プロジェクト期間における活動詳細は、以下の通りである。

(1) 業務完了報告書の作成

主要なカウンターパート、EWTI マネジメント、JICA 本部およびエチオピア事務所からのコメントを反映させた上で、第 1 期進捗報告書（2018 年 6 月）、第 2 期業務完了報告書（2019 年 5 月）、事業完了報告書（本書）をそれぞれ作成し、JICA 本部に提出した。

(2) JCC の開催

プロジェクト全期間を通して、全 10 回の JCC 会議が開催された。概要は以下の通り。

表 2-26：合同調整委員会（JCC）会議実績

No.	開催年月日	主な議事内容
1	2017/7/25	ワークプランの共有 プロジェクトのフレームワーク及び EWTI の役割確認
2	2017/11/1	ベースライン調査概要・方針共有 技術ギャップ調査進捗共有 合同モニタリング結果（モニタリングシート ver.1）の承認
3	2018/4/27	ベースライン調査結果共有・承認 パイロット研修計画（研修生選定方法）検討・承認 合同モニタリング結果（モニタリングシート ver.2）の承認
4	2018/9/7	PDM ver.2 協議 第 2 期ワークプラン共有・承認
5	2018/11/27	合同モニタリング結果（モニタリングシート ver.3）の承認 第 1 回パイロット研修の反省点と提言 研修マネジメントチームメンバーの再選定と承認 内部研修チーム/ナレッジマネジメント・タスクフォース　メンバーの選定と承認
6	2019/4/9	合同モニタリング結果（モニタリングシート ver.4）の承認 第 3 期活動計画（第三国研修、本邦研修含む）検討・承認 PDMver.3、POver.4.1 の承認 JICA ミッションからの気づき プロジェクト終了後の方向性について意見交換

7	2019/10/31	合同モニタリング結果（モニタリングシート ver.5）の承認 本邦研修及び招へい事業報告 収入活動の実現に向けたビジネスプランプロセスの促進
8	2020/9/8	合同モニタリング結果（モニタリングシート ver.6）の承認 EWTI ビジネスプラン進捗共有 コロナ禍の研修事業にかかる課題意識の共有 PDM ver.4 検討・承認
9	2021/8/4	合同モニタリング結果（モニタリングシート ver.7）の承認
10	2022/4/13	合同モニタリング結果（モニタリングシート ver.8）の承認 研修運営管理ガイドライン　ハイライト共有 掘削機等機材供与の前提条件整備状況再確認
11	2023/1/27	合同モニタリング結果（モニタリングシート ver.9）の承認 プロジェクト残り期間の活動検討・承認 プロジェクト期間延長提案・承認 機材維持管理に関する課題共有・意見交換 JICA-EWTI 協力 25 周年記念式典 掘削機等引き渡し式典
12	2024/7/25	合同モニタリング結果（モニタリングシート ver.10）の承認 プロジェクト全体評価

(3)　合同モニタリング

プロジェクト期間中、全 10 回の合同モニタリングを実施し、それぞれモニタリングシート ver.1 から ver.10 にとりまとめ、JICA 本部、JICA エチオピア事務所及び関係機関と共有した。

(4)　広報活動・ブリーフノートの更新

プロジェクトの広報活動として、各種イベントへの参加、広報ツールの作成支援などを行った。概要は下表の通り。

表 2-27：広報活動（イベント、広報ツール作成等）実績

活動時期	活動内容	備考
2017/10, 2018/03, 2019/10, 2020/03	EWTI ニュースレター発行支援	
2017/11	EWTI ウェブサイト立ち上げに協力	
2017/10	ジャパン・フェスティバルに EWTI ブース出展	広報ツール（卓上カレンダー、バナー）を作成・配布
2018/03	世界水の日イベント開催支援	EWTI が主催、会場提供
2018/10	ジャパン・フェスティバルに EWTI ブース出展	卓上カレンダーを作成・配布
2019/03	世界水の日イベントに EWTI ブース出展、セミナーへの参加	水エネルギー省敷地内及びキャピタルホテルで実施
2019/11	マルチステークホルダーフォーラムに参加	
2020/03	世界水の日イベント企画・運営主体として参加	新型コロナウィルスの影響で準備過程で中止が決定された。イベント用の広報ツールは一部新型コロナウィルスの緊急支援に活用された。

2018 年 6 月、2019 年 4 月、2024 年 7 月に、それぞれカウンターパート、JICA 本部および JICA エチオピア事務所の意見を取り入れながらブリーフノートの更新を行い JICA 本部に提出した。第 1 期及び第 2 期のブリーフノートは、上記の広報イベント等で印刷・配布し、広報活動に活用した。

その他活動

(1) 他機関との連携・協力

1) SMART Centre グループ[18]との連携

低コストの水技術を普及する目的で、アフリカ各国で活動を展開する SMART Centre グループとの連携で、EWTI 敷地内に低コスト技術（SMART 技術）を紹介するデモサイトを設置した。デモサイトは、2018 年 3 月の世界水の日イベントで関係者に紹介され、注目を集めた。デモサイトでは、揚水装置（ロープポンプ、EMAS ポンプ[19]、ACCESS ポンプ[20]、Afridev ポンプ[21]、ソーラーポンプ）、簡易リチャージシステム、雨水集水タンク、低コスト掘削ツール、低コストトイレの展示が行われた。EWTI は、組織として将来的に低コスト技術の普及や研修に活用することを目指し、また、SMART Centre グループの一員としてグループの認可を得て、アフリカに 5 か所ある SMART Centre の一つとしてその地位を得た。

2018 年 11 月、SMART Centre Group の支援と、一部専門家の支援を得て、EWTI 副総裁の Tamiru Fekadu 氏がマラウィで開催された SMART Symposium に参加した。また、12 月には、国連移住機関（UN IOM）の資金で、南部諸民族州におけるゲデオ県の住民に対し、低コスト技術（ムズズ・ドリリング[22]、ロープポンプ、井戸リチャージシステムなど）の研修を SMART Centre Group と EWTI の合同事業として実施した。EWTI からは研究・技術移転局の Teklemariam 氏がトレーナーの一人として参加した。研修に先駆け、第 1 期に SMART 展示場の立ち上げを支援してくれた Henk Holtslag 氏（オランダ人専門家）がエチオピアに来訪し（2017 年 11 月 26 日～12 月 8 日）、準備作業と研修実施の支援を行った。

2019 年 3 月～4 月、EWTI 側からの支援依頼を受けて、再び Henk Holtslag 氏がエチオピアに来訪し（3 月 25 日～4 月 2 日）、EWTI の技術職員 3 名、地方 TVETC（マイチョウ、アワサ、アソサ、バハルダール、マル・アウィ）の電気機械分野のトレーナー12 名を対象に、SMART 技術の導入研修を行った。本研修は、EWTI がエチオピア政府に提出した

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[18] *Simple, Market based, Affordable and Repairable Technology（シンプル、市場ベース、廉価で整備可能な技術）普及を目指すアプローチを普及する融資のグループ（http://smartcentregroup.com/）。現在タンザニア、モザンビーク、マラウィ、ザンビアにセンターが設置されており、低コスト技術の研究、民間技術者などへの研修、パーツ販売店支援などが行われている。オランダの会社 MetaMeta（http://metameta.nl/）が主導、Aqua for All（オランダ拠点の NGO、https://aquaforall.org/）、Skat Foundation（スイス拠点のシンクタンク、http://skat-foundation.ch/）、RWSN（http://www.rural-water-supply.net/en）などが協力している。*

[19] *EMAS ポンプ：http://akvopedia.org/wiki/EMAS_pump*

[20] *Access ポンプ：http://www.rural-water-supply.net/en/search?search=access+pump*

[21] *Afridev ポンプ：http://akvopedia.org/wiki/Afridev_pump*

[22] *Mzuzu ドリリング：Mzuzu-drilling-2.-How-to-make.-Vrs.-20210602.pdf (smartcentregroup.com)*

「100 日計画」に記載した SMART 技術研修実施のための TOT と位置付けられ、研修を受けた EWTI トレーナーは、TOT の後にアムハラ州マル・アウィ地域で住民に対する SAMART 技術研修を実施した。

2019 年 11 月 18 日～21 日、SMART センターグループのアドバイザーである Henk Holtslag 氏が再度エチオピアに来訪し、今後のセルフサプライ（SMART 技術）関連の活動について EWTI 総裁、副総裁と協議した。また、SMART 技術のデモサイトの改善と維持管理について、技術担当の職員と協議し、サイトにあるポンプの修理作業などを行った。

EWTI は、2019 年 11 月、水エネルギー省より公式にセルフサプライ促進業務を担う機関として任命され、セルフサプライ普及のセンターとしての役割も期待されている。2024 年 7 月に開催されたマルチステークホルダーフォーラム（MSF）では、セルフサプライが初日の全体セッション（上述の Henk Holtslag 氏も発表者としてオランダから参加）で取り上げられ、EWTI にセルフサプライの普及拠点として役割を果たしてほしいという声が聞かれた。

2) 海外協力隊との協力

2017 年 10 月、2018 年 1 月にそれぞれ派遣された水の防衛隊員 2 名と連絡を取り、業務上の情報交換や、プロジェクト活動における連携・協力を図った。具体的には、2018 年 3 月に行った SMART 技術のデモサイト設置において隊員に協力を仰ぎ、SMART Centre グループから派遣されたオランダ人専門家の補佐業務の他、世界水の日イベントの準備や当日の運営業務に協力してもらった。隊員は、業務への協力をする一方、彼らが隊員としての活動で普及するロープポンプ技術などについての技術や知識を得る機会となったと考える。

その後、計 6 名となった海外協力隊員（水の防衛隊）とは、情報交換を行い、2018 年 10 月に開催されたジャパン・フェスティバル出展時に隊員数名に協力してもらった他、同年 11 月 26 日～30 日、隊員は Henk 氏と一緒に EWTI で活動し、研修準備の支援、SAMRT 技術デモサイトの清掃などを行う一方、Henk 氏から SMART 技術に関する情報と技術指導を受けた。また、同期間中には NGO 関係者などを招いて、セルフサプライ会議を開催し、国内の Self-supply 拡大の可能性などについて隊員と意見交換を行った。

2019 年、治安悪化に伴う首都退避が続いている水の防衛隊の内、元アレタウォンド郡水事務所所属と元南部諸民族州水資源局所属の隊員が、それぞれ配属先変更を希望しており、「研修管理」担当及び「水質」担当として活動した。特に研修管理担当の隊員は EWTI を主体者とした大使館の「草の根・安全保障無償」の案件形成支援を行い、プロジェクトとも密に連携した。

3) エチオライス・プロジェクトとの連携

2017 年 12 月、エチオライス・プロジェクト（国立イネ研究研修センター強化計画）専門家チームの訪問を受けたことをきっかけに、同プロジェクトのカウンターパートである国立イネ研究研修センター（以下、NRRTC）の井戸掘削事業を、EWTI の掘削技術研修と連携して実施することになった。NRRTC が掘削研修に必要な費用の一部を負担して、

EWTI の掘削技術研修の実習現場として NRRTC を活用する共同事業が実現した。2018 年 5～6 月、掘削技術研修の実習が NRRTC 敷地内で行われた。EWTI は掘削研修に先駆けて技術者を派遣して地下水探査を実施し、井戸の設計を行ったほか、掘削に必要な人材派遣と機械の提供を行った。

同事業の主な成果としては、以下のようなことが挙げられる。

- NRRTC（EIAR）、EWTI、エチオライス・プロジェクトおよび EWTI プロジェクトの協働で、NRRTC 敷地内に同センターの給水用の井戸掘削（深度 120m）が完了した。
- EWTI トレーナー（水理地質、掘削技術分野）が、ポリマーなどの調泥剤を使用した泥水掘削技術の実践経験を積むことができた。
- EWTI トレーナー（同上）は、上記の掘削工法を使用したパイロット研修を実践した。
- EWTI トレーナー（水理地質分野）は、揚水試験の実践経験と、報告書作成（データ解析、柱状図作成含む）の実践経験を積むことができた。
- EWTI トレーナー・技術者（掘削機械整備分野）は、掘削現場での掘削機械整備実践の経験を積むことができた。
- NRRTC、EWTI は、両機構の協働事業の一連の手順（計画・実施）の実践経験を積むことができた。

一方、以下のような課題と教訓が得られた。

- EWTI も NRRTC も公益機関であるため、井戸掘削などの委託手続きを行うのは制度上困難である。
- 掘削工事に関わった EWTI 職員のインセンティブは出張費のみで、民間等への業務発注に比較すると低額であったため、不満を訴える者もいた。
- 業務委託ではなく出張扱いであるが故に、工事に携わった EWTI 職員側に、工事の内容や質に対する十分な責任意識を問えない状況であった。
- EWTI 組織内部での連携事業の意義にかかる理解が不十分であった。「何故、遠くへ行って研修する必要があるか」という組織内の意見もあった。

(2) IT 教室の整備

EWTI 側の強い要望から、また将来 GIS を活用した研修等で必要となることから、プロジェクトとして EWTI 内の IT 教室の整備支援を行った。研修効率の向上とコンピューターソフトウェアの管理の効率化を図るため、IT 教室のコンピューターのネットワーク化を行った一方、ウィルス感染を防ぐために外付けメディアの使用を制限する設定を行った。また、IT 教室を使用するトレーナーや研修生向けの管理ルールを設定するとともに、指導、管理が適切に行われているか否かカウンターパートと共にモニタリングを行い、コンピューター管理の意識向上と持続的な管理実践を支援した。

IT 教室には、コンピューター使用時や使用後の注意書きが貼られ、管理者（研修を担当するトレーナー）による研修参加者への注意喚起などが行われた。

(3) インターン受け入れ

プロジェクト期間に、宇都宮大学国際学部のキャリア実習生 3 名、JICA インターン生 4 名、合計 7 名のインターン生受け入れを行った。概要は下表の通り。

全てのインターンシップ期間を通して、インターン生に週報の提出を課し、毎週の活動報告と次週の計画を行うよう促した。週報は総括がコメント付きで返し、参考にしてもらった。受け入れの時期によってインターン生が体験できる活動内容が異なり、統一されたアウトプットはないが、その時々に本人の関心が高い事項の体験や考察ができるよう最大限支援し、何かしらのアウトプットをしてある程度の達成感が得られるよう工夫した。一部のインターン生からはその後のキャリア形成に EWTI でのインターン体験を生かしたこと、卒業論文の題材にしたなどの報告を寄せてもらった。

表 2-28：インターン受け入れ実績

No.	スキーム（プログラム）名	年月・期間	主な活動
1	宇都宮大学キャリア実習（国際学部 3 年学生 1 名）	2018/01～06（5 カ月間）	研修生データ整理指導、IT 教室整備、世界水の日イベント企画・運営業務支援、研修映像記録作成
2	宇都宮大学キャリア実習（国際学部 3 年学生 1 名）	2018/03（3 週間）	世界水の日イベント企画・運営補佐、研修映像記録作成
3	JICA インターンシップ・プログラム（大学 4 年生 1 名）	2018/10～11（39 日間）	パイロット研修記録作成、エチオライス・プロジェクトでの井戸掘削研修運営・記録補佐
4	宇都宮大学キャリア実習（国際学部 3 年学生 1 名）	2019/08（14 日間）	ガイドライン策定ワークショップ運営・記録補佐、研修案内ブックレットおよびニュースレター作成支援、開発パートナーとの面談、浄水場視察など
5	JICA インターンシップ・プログラム（大学 3 年生 2 名） *1 名は本人都合で研修中断、帰国	2019/08（10 日間）	ガイドライン策定ワークショップ運営・記録補佐、研修案内ブックレットおよびニュースレター作成支援、浄水場視察など
6	JICA インターンシップ・プログラム（大学院生 1 名）	2019/08～09（22 日間）	各種研修視察、各種会議への参加、職員・専門家へのインタビュー、パイロット研修リハーサルへの参加、研修ブックレット作成支援、JCC 会議準備支援など

(4) ビジター受入れ

プロジェクト期間を通して、下表の通りビジター受入れを行った。

表 2-29：第 2 期ビジター受け入れ実績

訪問時期	ビジター名、所属機関	備考
2017/08	宇都宮大学国際学部スタディーツアー	このツアーがきっかけで、2018 年 1～6 月、宇都宮大生 2 名をインターンとして受け入れることになった。
2017/10	JICA アフリカ部長	
2017/11	佐藤外務副大臣 在エチオピア日本大使	

訪問時期	ビジター名、所属機関	備考
2017/11	SMART Centre グループ、アドバイザーの Henk Holtslag 氏	この訪問で SMART Centre グループとの協力関係が始まった。
2017/12	エチオライス・プロジェクト専門家チーム JICA エチオピア事務所農業担当職員	この訪問がきっかけで、国立イネ調査研修センターと EWTI の連携事業として、同センターで井戸掘削を実施する運びとなった。
2018/03	上智大学　東大作准教授	南スーダンの平和構築支援の一環として、EWTI を研修施設として活用するアイデアが浮上した。将来の収入活動の一部として協力が可能かもしれない。
2018/04	（株）LIXIL	SMART Centre グループとの連携活動の一環として、EWTI 敷地内の SMART 技術デモサイトで SATO トイレの設置を行った。
2018/10/15	在エチオピア日本大使 在エチオピア AU 大使 大使館職員 2 名 JICA エチオピア職員 2 名	国会議員 EWTI 視察のための事前視察 ワークショップでの研修の様子を視察 17 日の視察スケジュール打合せ
2018/10/17	在エチオピア日本大使 在エチオピア AU 大使 国会議員（自民党）2 名 大使館職員 2 名 JICA エチオピア職員 2 名	プロジェクト説明資料の提供とプレゼンテーション ワークショップ視察 SMART 技術デモサイト視察

2.4　専門家派遣実績

日本人専門家派遣実績は、下図の通り。詳細は添付資料 15 を参照。

表 2-30：日本人専門家派遣実績

担当業務	格付	人月合計
北詰　秋乃　（総括/研修運営管理1）	2	33.17
池元　壮彦　（副総括/研修運営管理2）	3	12.70
鈴木　克明　（カリキュラム作成/教材開発1）	3	6.11
伊藤　拓次郎（カリキュラム作成/教材開発２）	3	3.62
木原　茂樹　（地下水開発１）	3	5.70
徳田　誠　（地下水開発２）	5	2.83
宇佐美　栄邦（掘削技術１）	4	8.87
小肩　雅之　（掘削技術2）	4	6.00
石井　完　（掘削機械整備）	3	7.17
山本　進　（掘削機械整備2）	3	6.53
阿部　功二　（電気機械整備）	4	7.17
香取　武春　（電気機械整備2）	4	3.00
須原　敦　（Eラーニング教材開発）	3	4.63
小松　聡　（ビジネスマネジメント）	3	1.43
玉井　彩香　（研修教材作成2）	5	3.50
宇佐美　栄邦（仕様書作成）	3	1.60
中野　武　（積算）	3	1.00
田島　伸明　（業務調整/研修教材作成）	5	3.02
岩田　瑠美　（業務調整2/研修教材作成3）	6	7.17
川合　菜月　（業務調整3/研修教材作成4）	6	1.36
田島　伸明　（業務調整4/研修教材作成5）	6	1.80
実績（合計）		108.19

2.5　投入実績

プロジェクト全期間における投入実績に関する以下の資料を、それぞれ添付資料にて報告する。

表 2-31：投入実績に関する資料一覧

報告内容	添付資料番号
WBS による活動実績	添付資料 16
機材リスト	添付資料 17

第3章　PDM に基づくプロジェクトの成果

2024 年 7 月に実施したカウンターパートと専門家チームによる第 12 回合同モニタリングの結果に基づき、第 3 期末時点でのプロジェクト成果の達成状況を下表の通り取りまとめた。第 10 回モニタリングでは、PDM Ver.5 の指標を使用した。

3.1　成果 1

成果 1：PDCA サイクルに基づき、EWTI 教育訓練総局の研修マネジメント能力が強化される。	
指標	第 3 期までの実績
1-1　研修ニーズ、研修評価結果が、研修計画に反映される。	第 1～2 回パイロット研修の評価結果から抽出された課題や教訓が第 3 回パイロット研修の改善に活かされた。
1-2　研修運営管理ガイドラインにパイロット研修の評価結果が反映される。	第 1～3 回パイロット研修の評価結果を生かし、研修運営管理ガイドライン Ver. 3 が承認され、関係者に配布された。
1-3　教育訓練総局が、ガイドラインを使用して、国外の研修生を対象とした研修計画・運営を 1 回以上実践する。	第 3 回パイロット研修として、マラウィ及びナイジェリアからの研修生を受け入れ、計 2 コースの国際研修を実施した。
実績および実施プロセスの検証	
第 1 回～第 3 回パイロットプロジェクトを通して、PDCA サイクルを用いた研修運営管理の改善が行われた。研修運営管理の方法と手順は標準化され、「研修運営管理ガイドライン」に取り纏められた。内容は、パイロット研修を通して得られた教訓と改善案を盛り込み更新を重ね、Ver.3 がプロジェクトの最終アウトプットとして承認され、印刷・配布された。ガイドラインは生きた文書であるため今後も改善・更新を重ねることが期待されているが、EWTI 職員らが自らの実体験を文書化し、2 回にわたる改訂を行ったことで、ガイドラインへの責任感とオーナーシップが醸成されたことは、評価に値する。同ガイドラインは、プロジェクトが対象とした研修分野に限らず、EWTI の全ての研修コースで適用されている。 第 1 期に結成され、2018 年 12 月にその重要性と役割の再確認が行われた「研修マネジメントチーム」は、上記ガイドラインで規定された「研修マネジメント委員会」として再編された。同委員会はガイドラインにおいて、研修管理の主体と位置付けられ、研修の質の管理や研修モニタリングを担うが、実践においては多忙なマネジメント層が研修モニタリングに関わる機会は十分とは言えず、今後も実態に合わせた実施の体制を整え、管理を持続的に実施することが期待される。 研修生の募集・選定手続きにおいては、インターネット環境を活用したコミュニケーションが試されるなどある程度の改善が見られる。しかし、新型コロナウィルスや内戦の影響で一部地方からの研修生の研修参加が困難など、当初想定とは異なる環境変化の影響もあるため、ガイドラインに沿った研修生募集・選定の実践にかかるモニタリングが継続的に実践されることを期待したい。	

3.2　成果 2

成果 2：パイロット研修を通じて、同研修を担当する EWTI トレーナーの指導能力が向上する。	
指標	第 3 期までの実績
2-1　EWTI トレーナーが作成したカリキラム、テキスト、指導案が承認される。	- 第 1～2 回パイロット研修の反省点を踏まえ、研修モジュールと TTLMVer. 3 作成・改訂を行った。研修 2 分野（掘削技術、電気機械整備）の TTLM Ver.3 は第 3 回パイロット研修で使用し、その内容が確定され、研修管理委員会で承認された後、印刷・配布された。

2-2　パイロット研修を担当するトレーナーが、能力強化研修で身に着けた技術（実技及び教授法）を実践する。	- 研修各分野（地下水開発管理、掘削技術、電気機械整備）において能力強化研修でトレーナーが身に着けた技術がパイロット研修で活用された。 - 掘削機械整備分野については、トレーナーの不在でパイロット研修は実践できなかった。同分野については、機材メンテナンスチームのメンバーが OJT で掘削機整備を実践した。
2-3　パイロット研修の 70%以上の参加者が、設定した目標を達成する。	- 第 1 回パイロット研修の泥水掘削研修コースの半ばで離脱した一部の参加者を除き、第 1～3 回パイロット研修参加者の全員がセルフチェックや LAP テストで合格点を獲得し、研修を修了した。

実績および実施プロセスの検証

研修教材としては、教育省で定める TTLM に準ずる EWTI 版の TTLM の形を標準化し、研修運営管理ガイドラインに明記した。EWTI の全てのコースにおいて、同標準が適用されている。TTLM は、研修の目的や評価基準が明記されることになっており、学習成果を評価した上で、研修生の合否と研修認定を行うようデザインされている。プロジェクト開始時は整備されていなかった研修成果の評価をシステムに組み入れた点や自主学習を促す教授法、標準化された研修内容を教材通りに指導するという点は、大きな改善点であったと評価できる。

プロジェクトの対象分野 4 つの内、全てのコースで TTLM が作成され、そのうち 2 分野においては Ver.3 まで改訂が行われ、それらの教材は第 3 回パイロット研修で外国人研修生向けのコースで使用され、その研修内容は研修生にも高く評価された。掘削機械整備においては、EWTI 内に研修コースリーダーとなる人材が最後まで配置されず、第 1 回パイロット研修において外部トレーナーによる教材作成と研修が実施された以外は、研修実践はできなかった。地下水開発分野については、教材 Ver.2 までの改訂が行われたが、その後担当トレーナーの実力ややる気不十分が要因で、Ver.3 改訂には至らなかった。

プロジェクトで技術面、指導法の能力強化を受けたトレーナーたちの能力は向上し、研修実践に活かされている。一方、掘削機械整備分野のコースリーダー不在や掘削技術分野の人材不足などについて、改善の努力は見られたものの実態として、不足状態は継続しており、今後の人材補填やインセンティブ強化への努力が期待される。

また、コロナ禍を経て大きく需要が伸びたオンディマンドコースに関しては、EWTI の既存研修モジュールを使用せず、標準化した TTLM を使用しないケースも増えており、今後の研修の質管理においては、課題も残る。

3.3　成果 3

成果 3：EWTI 教育訓練総局において内部研修の実施体制が整備される。	
指標	第 3 期までの実績
3-1　内部研修の教材と計画が作成され、承認される。	- TTLM 改訂のための教材（TTLM）を作成した。毎年教材のレビューを行うことがガイドラインで明記され、プロジェクト終了時まで継続して使用されている。 - 掘削機械整備において、実践した機械点検整備の手順を写真付きでまとめたテキストを作成した。 - 教材レビューの年次開催以外、年次計画に内部研修の計画は記載されていない。
3-2　内部研修の参加者の 80%以上が各研修で設定された目標を達成する。	- 内部研修（TTLM レビュー）、技術研修等においては、その目標が達成された。
3-3　対象 4 分野の研修教材が適切に保存される。	- 対象 4 分野の内、3 分野（地下水開発、掘削技術、電気機械整備）の教材はポータルサイトに保存されている。その他の分野も含め全 14 モジュールの教材も同サイトに保存されて

	いる。 － 対象の残りの 1 分野の内、掘削機械整備については TTLM が作成されなかった。
3-4　機材メンテナンスチームの TOR が総裁に承認される。	－ 機材メンテナンスチームの TOR は総裁に承認された。
3-5　機材メンテナンスチームによる定期点検が 6 カ月以上実施される。	－ 定期点検は、開始されて途中で停滞することが複数回繰り返された。2022 年 11 月以降はほとんど定期的な点検は実施されていない。
実績および実施プロセスの検証 TTLM 改訂の内部研修は、2019 年 8 月の開始以来、2021 年、2022 年と継続して実施されている。ガイドラインでは 1 年に一度の TTLM レビューが規定されており、今後も継続される可能性は高いと考えられる。 EWTI 総裁主導で、機材メンテナンスチームが結成された。同チームは、研修に必要な資機材の定期点検や保守管理を継続して行い、また、メンテナンスに必要な技術（特に掘削機械・電気機械整備）の内部研修を担うことが期待された。TOR が承認され、メンバーが正式に任命されたが、メンバーのインセンティブ不足、組織内で部局を跨ぐチームの指示系統統一の困難、点検報告に対するパーツ購入などの組織的対応が不足するなど複数の課題があり、継続は困難な状況となっている。メンテナンスチームをけん引するリーダーシップの不在、組織的な支援体制も不十分という状況が構造的に解決しない限り、機材メンテナンスチームの存続は難しいと言わざるを得ない。収入活動が開始され、収益の内部還元が可能になることにより、この状況が打開されるという期待があったが、プロジェクト期間中に解決には至らなかった。	

3.4　プロジェクト目標の達成度

第 3 期末時点でのプロジェクトの目標達成度は以下の通り。

プロジェクト目標：EWTI 教育訓練総局の研修運営・管理体制が強化される。	
指標	第 3 期までの実績
1　研修ガイドラインが承認されパイロット 4 分野の研修に活用される。	研修運営管理ガイドライン Ver. 3（添付の統一書式含む）が承認され、EWTI の全ての研修コースに適用されている。
2　EWTI が作成された TTLM を基に短期研修を継続して実施する。	EWIT は作成された TTLM を基に短期研修を継続して実施している。
3　内部研修のシステムが組織化される（計画、実施、報告）。	プロジェクト期間中に継続して TTLM レビューワークショップが計画、実施、報告された。 機材メンテナンスチームの内部研修は計画・実施されたが、定期点検・報告は定着していない。
実績および実施プロセスの検証	
プロジェクト目標はおおむね達成したと言える。成果 1 と成果 2 に関しては、対象とした研修分野にとどまらず、EWTI 全体の研修運営管理において、プロジェクトが作った研修運営ガイドラインが適用され、標準化された研修教材（TTLM）の様式が全ての研修モジュールに適用されるなど、当初計画以上の成果が上がった。 成果 3 については、内部研修として TTLM レビューワークショップが毎年実施され、組織内でほぼルーティン化された。同ワークショップは、ハイブリッド研修の手法を用いて EWTI トレーナー主導での計画・実施が可能である。一方、機材メンテナンスチームによる機材の定期点検・報告の活動には課題が残った。	

3.5　6 項目評価

3.5.1　妥当性

本案件は、エチオピア国の上位開発計画である 10 か年計画（A Pathway to Prosperity

2021~2030）にある「自助的な経済開発（Homegrown economic reform：HGER）の方針や給水のアクセス率 100%への拡大を掲げる水資源開発戦略、職業訓練校の増加や技術者の研修参加率の拡大を掲げる人材開発戦略に合致したものである。

カウンターパート機関である EWTI は、エチオピア国の水セクターにおける実践的な水技術の人材育成機関として重要な位置にあり、将来的には東アフリカの水技術部門の人材育成を担う組織として成長することが目標とされている。

EWTI の自立発展を上位の目標に掲げ、人材育成のコア部分である研修運営管理能力の向上を図った本プロジェクトは、妥当なものだったと言える。

新型コロナウィルスの拡大や内戦という社会的に大きな影響を与えた環境の変化に対し、プロジェクトは緊急対応として井戸リハビリテーションや給水施設整備の緊急クルーの派遣や手指消毒液の配布など、当初計画には含まれていない活動も行った。また、非対面の研修方法（E ラーニング）の検討など、社会に新たに生じたニーズにも柔軟に対応した。その時々に必要なニーズを理解し、軌道修正を行い、柔軟に目的の達成を目指した点においても、妥当だったと判断できる。

3.5.2　整合性

本案件は、日本国政府の ODA 白書や国別開発協力方針の重点課題 3 インフラ開発にある開発課題 3-3 安全な水へのアクセス向上と都市衛生対策と整合し、JICA の先行案件の経験や教訓を生かした形でデザインされた。

JICA の他事業とも必要に応じて連携・協力し、相互の経験交流や関連付けを行う工夫をした。例えば、エチオライス・プロジェクトとの連携では、同プロジェクトの施設の給水改善のための井戸建設を EWTI の研修の一環として実施するなど、活動の連携や効率化を行った。また、カイゼンの導入においては、JICA 事業でも関わりのあった EKI との協力・連携を試み、具体的協力のための協議を行ったが、EWTI 側がエチオピア人に指導されるのを好まないという理由から、カイゼン・コンサルタントの派遣には至らなかった。

水の防衛隊との連携においては、複数回にわたり EWTI 構内での研修実施や広報イベントを協力して行った。また、任地変更で 2 名の水の防衛隊員を EWTI に迎え、草の根・人間の安全保障資金協力の案件形成を協力して行った。

世界水の日イベントで中心的な立場で企画運営に携わるなど、エチオピア国水セクター全体における関係者との連携・協力も積極的に行い、水セクターにおける連携強化にも協力したほか、特に新型コロナウィルス感染拡大の時期には、国際機関や NGO などとも連携して緊急対応に携るなど、セクター内での重要な役割を積極的に担ってきた。

よって、本事業における支援の整合性は高いと言える。

3.5.3　有効性

期待された事業効果は、プロジェクト終了時現在発現したと考える。

まず、EWTI の研修運営管理能力については、研修運営管理ガイドラインの内容に集約されるが、顕著に向上が見られたと考える。研修運営管理方法と手順の標準化、研修生の選定・募集にかかるルール作り、研修スケジュールや研修内容の標準化と順守、研修効果の測定の定着化など、プロジェクトデザイン時に課題とされていた多くの事項が、主要な

カウンターパートに理解され、同ガイドラインに反映され、教育訓練総局によって実践された。さらに、標準化された TTLM によって、研修内容やトレーナーの指導技術が整備され、パイロット研修を通してそれらを検証し、トレーナーの研修計画・実施・評価の能力強化にもつながった。当初計画では対象となる研修分野は 4 分野と定められたが、分野ごとに成果の発現はばらつきがあった。掘削機械整備分野においては、パイロット研修は 1 回のみの実施となったほか、教材の作成・更新も予定通りには行われなかった。これらはカウンターパート不在が主な要因である。

一方、当初計画では対象とならなかった研修分野においても、ガイドラインが適用され TTLM の策定が行われるなど、計画時以上に効果が発現した部分もあった。ガイドラインと TTLM の普及範囲と定着度を鑑みると、この点は高く評価できる。

上記のことから、プロジェクトの有効性は中高程度と判断される。

3.5.4　インパクト

研修運営管理ガイドラインにおいては、プロジェクトの主要なインプットである 3 回のパイロット研修が終了した 2020 年以降、プロジェクト終了時の 2024 年まで継続して EWTI の全ての常設研修コースでその内容が実施されている。このことから、プロジェクトの上位目標も達成される見込みが高いと考えられる。

エチオピア国内で水分野の人材育成に EWTI が担う役割は大きい。コロナ禍での社会ニーズの変化や、ドナー等のアプローチの変化によるオンディマンド研修需要の急増など、変化するニーズに EWTI は柔軟に応えてきた（オンディマンド研修の増加については、前出 2.3(2)項を参照）。プロジェクトが EWTI の研修運営管理能力を強化したことが、EWTI への信頼度や期待の向上に貢献した一つの要因であったと考えられる。

これらの変化は、プロジェクトが EWTI の研修運営管理能力を強化したことによってさまざまな研修ニーズに対応できるようになったことに加え、EWTI の活動をマルチステークホルダーフォーラム等で積極的に外部へ発信してきたことのインパクトとして表れていると考えられる。

更に、2024 年 7 月、EWTI は WaterAid との連携で主に地方都市の上下水道公社のための研修教材（TTLM）を 10 種類発行している。この教材は、EWTI 型 TTLM の枠組みで作られており、プロジェクトの成果が他ドナーによる協力にも波及した事例である。

また、プロジェクトチームは、事業開始当初から EWTI の自立発展を目指し、特に収入活動と収益の組織内還元による組織の持続性確保、研修機関としての価値や質の維持向上への貢献の重要性に気づき、ビジネスプランや収入還元のガイドライン策定への支援を行ってきた。ビジネスプランは 2021 年までに水エネルギー省に提出されており、現時点では財務省による収入還元の承認待ちの状態となっている。近い将来収入還元が可能となり、組織の自立発展が加速されることが期待されている。

3.5.5　効率性

事業期間、投入計画は 7 回契約変更され、投入は当初計画を大幅に上回った。事業期間の延長及び投入の増額は、第 1 に、新型コロナウィルス拡大による現場での活動の制限が長期に亘ったこと、第 2 に、2021 年より深刻化した国内情勢の悪化により、不可抗力で

やむ負えないものと判断できる。コロナ禍以前の 2020 年 3 月時点で、想定したプロジェクト成果はほぼ達成できており、その後のプロジェクト延長期間には、新型コロナウィルス対策やコロナ禍での新たな活動など、当初計画以外の活動を追加したものであり、当初計画による投入は効率的に成果に結びついたと言える。

2020～2021 年の延長期間においては、新型コロナウィルス拡大及び国内情勢悪化により、社会的なニーズの変化に対応した。非対面での研修方法の検討は、新たなニーズに対応したものである。ハイブリッド研修の導入では、EWTI における新たな研修方法を導入するきっかけとなり、内部研修でファシリテーター役となったトレーナー3 名はオンラインの会議ツールや LMS を活用して TTLM レビューの企画運営ができるまでに力をつけ、他ドナーによるオンディマンド研修等でも活躍している。本活動においては、オンライン会議ツールの通信や対面研修用の会場費以外にはさほど大きな費用はかけずに効果を発現させることができた。

同期間における遠隔操作での活動による業務の非効率化も期間延長と投入増との密接な関係がある。劣悪なインターネット環境と、インターネットを活用した通信や遠隔業務になれないカウンターパートとの作業は、思いのほか困難で時間と手間のかかるもので、コロナ禍では特に作業効率が下がり、活動期間の延長は妥当なものであり、困難な状況でもハイブリッド研修など新たな活動で付加価値となる成果を上げたことは評価できる。

2021 年 9 月以降のプロジェクト期間延長は、コロナ対応として掘削機等機材の供与にかかる機材調達支援活動が加えられ、同機材を用いた井戸掘削 OJT の活動追加されたことによる。また、調達した供与機材の掘削機の不具合により、プロジェクトが点検整備等の対応を行ったことが挙げられる。

上記の通り、プロジェクトが回避、予測不可能な環境の変化が本事業の事業期間、事業費の変更に与えた影響は甚大であり、事業投入計画と実績の単純比較は難しいが、プロジェクトの当初計画による投入で概ね成果が達成されていたこと、コロナ禍での期間延長においては困難な状況で付加価値のある成果を発現させたことは評価でき、効率性は中程度であると評価する。

3.5.6　持続性

プロジェクトの成果 1、成果 2 の活動で発現した成果は、コロナ禍や内政不安の時期を経て、主要な活動が終わった 2020 年から 4 年が経過した現在も継続している。具体的には、研修運営管理ガイドラインの実践が継続、標準化された TTLM の使用、更新作業も継続している。これらの成果の持続可能性は高いと考える。

一方、内部研修のシステムや機材メンテナンスチームの持続性については、それを証明できる材料が多いとは言えず、課題が残る。機材メンテナンスチームは、EWTI の総務局に所属する職員と教育訓練総局に所属する技術職員の混成で構成されており、業務指示系統を統一できなかったこと、スペアパーツ購入予算をどの部署から工面するかなどについて、組織内で明確に問題解決できなかったこと、メンバーとなった職員が機材の維持管理は追加業務と考え金銭的なインセンティブなしに継続することが困難と考えたことなどが不継続の主な要因である。2024 年 6 月から非公式ながら運用されている EWTI の新たな体制では、機材メンテナンスを担う部署が新設される体制となっており、持続的な機材

の点検やメンテナンスの必要性は十分理解されたと判断できるが、プロジェクト終了時に体制が確保されるには至らなかった。

上記のことから、持続性は中高程度と言える。

第4章　プロジェクト実施・運営上の課題・工夫・教訓

4.1　実体験に基づく文書作成（研修運営管理ガイドライン）

上記図 2-4 で示した通り、本プロジェクトでは、PDCA サイクルを回しパイロット研修の計画・実施・評価・改善のプロセスを繰り返すことにより、主要な技術成果品である研修運営管理ガイドラインと教材（TTLM）を作成・更新した。

研修運営ガイドラインの内容は、全てカウンターパートと共に執筆を行い、パイロット研修で実践・検証したもので、理想と現実が乖離しているものについてはパイロット研修毎に改善と修正を重ねてきた。本文書は、その性質上「ファイナル」は存在せず、必要に応じて修正と更新を行う生きた文書であると位置づけられている。

プロジェクト終了までに 2 回の改訂を行い、終了時には Ver.3 を印刷・配布した。作成・更新作業をカウンターパート主体で実施したため、オーナーシップ意識が醸成されたと考えている。プロジェクト終了後も、継続して本ガイドラインが実践される可能性は高い。

EWTI では、本ガイドラインの内容が実践されているか否か、チェックリストによる研修後の簡単な評価を行っており、プロジェクト終了時時点では、Google-form を用いたオンラインでの評価提出を各コースリーダーや教務課などに課すことが方針づけられた。

4.2　インストラクショナルデザインの導入

プロジェクトの第 1 期中に、トレーナーを対象としたインストラクショナルデザイン（ID）ワークショップを 4 回実施した。指導能力強化にかかる主要なポイントは表 4-1 の通り。（詳細は表 2-12）また、ID に関する主要概念を下記 Box に示した。

表 4-1：ID の要点と研修改善点

ID の要点	EWTI の研修改善点
研修設計の 3 つの質問	研修目標の明確化
5 つの学習目標	学習目標の明確化（言語情報から知的技能へ）
9 つの教授事象	指導法の改善
4 レベル研修評価	学習効果の確認 実技能力評価の導入

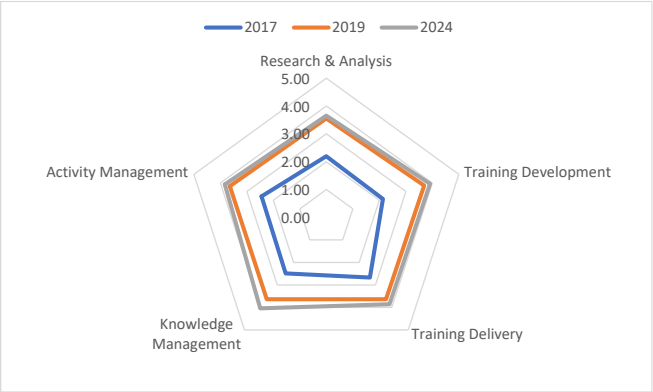


図 4-1：トレーナーの ID 能力評価結果

ID ワークショップでトレーナーたちは、それらの主要概念を中心とした効果的な研修に役立つ ID の要素を学習した。それらの要素は研修運営ガイドライン及び TTLM 作成のプロセスで活かされており、研修実施や運営の改善に役立った。冗長で研修では教えない情報が含まれていた研修教材は徹底して必要最低限の情報に絞られ、研修内容は標準化したものをどのトレーナーが教えても同様の内容と質が担保できるよう工夫された。不要に長く、内容の

コントロールが難しかった野外実習の内容は、短期化効率化され、野外実習の不確定要素を排除するよう工夫された。学習評価は全ての教材に標準内容として取り入れられ、実技試験による合否を評価できるようにした。

トレーナーの ID 能力はプロジェクト開始直後の 2017 年、中間の 2019 年、プロジェクト終了時の 2024 年にそれぞれ同じ方法でトレーナーの自己評価を行った。図 4-1 の通り、トレーナーたちは能力が向上したと自己評価している。特に、プロジェクト開始時点で評価が比較的低かった研究分析、研修開発の能力においては、それぞれ平均点が 2017 年の 2.19、2.14 ポイント（5 点満点）から 2024 年の 3.65、3.92 ポイントへと上昇しており、大きな伸びを見せた。2019 年から 2024 年の能力の伸びは比較的緩やかとなっている。ID にかかる主要なプロジェクトの投入は 2020 年 2 月に第 3 回パイロット研修の終了を持ってほぼ終了したこと、コロナ禍で EWTI における研修活動が一時停滞したことなどが要因と考えられる。

2020 年にはマラウィ及びナイジェリアからの研修生を受け入れ、国外の研修生を対象にした研修が実現し、参加者からの高い評価を受け、トレーナーたちの大きな自信となった。

Box：インストラクショナルデザインの主要コンセプトと EWTI の研修改善

3 つの質問

アメリカの教育工学研究者メーガー（Robert F. Mager）が呈した授業設計の基本の 3 つの質問。どこへ行くのか？どうやって到達したことを知るのか？どうやっていくのか？研修設計の基本的考え方として採用した。

5 つの学習目標

ガニェ（Robert M.Gagne、フロリダ州立大学名誉教授、1917～2002）は、インストラクショナルデザイン理論の生みの親。研修で目指す学習成果は 5 つ（言語情報、知的技能、認知的方略、態度、運動技能）に分類されるとした。EWTI の研修では、言語情報中心のものから、知的技能の習得を目指すものへシフトするよう指導した。

9 つの教授事象

ガニェの ID 理論で提唱する「9 つの教授事象（学習を支援する働きかけ）」には、①注意喚起、②学習目標の提示、③前提条件の確認、④新情報の提示、⑤学習指針の提示、⑥練習、⑦フィードバック、⑧学習成果の評価、⑨保持確認と定着促進という人の学習プロセスに沿った外部支援の形が提唱されており、EWTI の研修においても教授法の改善にこの考え方を取り入れた。

4 段階研修評価モデル

アメリカの経営学者カークパトリック（Donald Kirkpatric、1914～2014）が提唱した研修評価の 4 段階モデル（下表）。研修を意味のあるものにするには、レベル 4 までの成果を求めるべきだと主張した。このモデルは、EWTI の研修評価標準として、研修実施運営ガイドラインに明記された。

レベル	評価項目	本プロジェクトでの活動
1．反応	参加者は教育に対してどのような反応を示したか？	参加者による研修評価を標準化
2．学習	どのような知識とスキルが身についたか？	TTLM で LAP テスト（実技試験）を標準化
3．行動	参加者はどのように知識とスキルを仕事に活かしたか？	ガイドラインに 3 年ごとのインパクト調査を明記
4．結果	教育は組織と組織の目標にどのような効果をもたらしたか？	同上

4.3　TTLM の標準化

プロジェクト期間を通して取り組んだ EWTI の教材（TTLM）の標準化作業においては、ガイドライン同様、文書作成、パイロット研修による実践と検証、評価、改善を繰り返して最大 Ver.3 までの改訂を行った。

本プロジェクトの設計段階では明らかとなっていなかったものの、取り組みの過程で、教育省が定める TVET の教育方法論がかなりしっかりと確立されており、教材の標準形が「ガイドライン」として存在することが明らかとなった。EWTI における研修は一応、TVET 教育からは独立しているものの、TVET 教育と重複している分野があるなど、EWTI が各地の Water-TVET の支援を行っていることから、全く別なカリキュラムを作成するよりも現行のシステムとの親和性を高め相互に役立つものとする方が効果的と判断された。

一方、4.2 で述べた ID の考え方の導入によるより効果的な研修設計・実施のために、現行の TVET の標準型 TTLM に EWTI 独自の工夫を加えた EWTI 型 TTLM が誕生した。特徴としては、セルフチェックを各単元の冒頭で実施する「セルフチェック・ファースト」方式である。これにより、学習者の自己学習が促進され、また、学習者が既に有している知識を更に研修で教えるという重複を避けることができる。次に、トレーナー用の TTLM 標準装備されている PEG（評価ガイド）を研修単元教材の初めに作成する手順を徹底し、各研修単元の目標設定を明確にし、目標達成のための研修内容のスリム化を行って、最短距離で目標達成することを目指した。トレーナーが教えたい内容（nice-to-know）を研修内容とするのではなく、目標達成のために必要最低限の内容（Must-to-know）のみを選定する指導を行った。内容のスリム化により、講義時間が短縮され、その代わりに実技（修練）時間を増加するようにした。これらの工夫を含む、EWTI 型 TTLM 改訂の方法は、文書化して内部研修の教材とした。本教材は「TTLM for TTLM」として Google Classroom のプラットフォームを構築し、オンラインでも活用できるようにし、内部研修のトレーナーにはオンライン教材を用いたハイブリッド研修の方法を指導した。

EWTI では全ての常設コースに EWTI 型の TTLM を使用している。また、2024 年 7 月に WaterAid と EWTI 共同で発行された、地方水道公社向けの研修教材は、この TTLM の枠組みで作成され、波及効果も表れている。

4.4　コロナ禍での柔軟な対応（E ラーニングの検討）

本プロジェクトは、当初計画では終了間近となっていた時期に、未曽有の新型コロナウィルス感染拡大という世界を揺るがす事態に遭遇し、プロジェクトの存続はもちろんのこと、プロジェクト支援の内容を見直さざるを得ない大きな転機を経験した。

プロジェクト専門家は、別途述べるコロナ禍における緊急対応を行う一方、社会ニーズの変化をいち早く察知し、プロジェクトの目的や EWTI の自立という目標に向けプロジェクトが何をすべきか柔軟に検討し、変更提案を行った。

例えば、当初計画には含まれていなかったものの、長期にわたり対面での研修実施を制限される状況となった EWTI の当時の状況を踏まえ、オンラインの学習管理システム（LMS）を活用した E ラーニングの検討を早期に開始した。試行錯誤の結果、E

ラーニングの全面的導入を実施する前に、エチオピアのネット環境や参加者の現状を踏まえ、ハイブリッド研修（E ラーニングと対面研修の方法を用いた研修）を提案し、効果を上げることができた。EWTI トレーナーが自力で TTLM 改訂ワークショップの計画・運営を実施できるレベルまで到達している。

第5章　上位目標達成に向けての提言

5.1　第 1 期にとりまとめたプロジェクト実施・運営上の課題と対応策

プロジェクト第 1 期の進捗報告書に、プロジェクトで継続的に取り組むべき 8 つの課題を①プロジェクト実施・運営上の課題②上位目標の達成に係る課題③組織の持続性にかかる課題の 3 つの視点から以下のように整理した。プロジェクトでは、プロジェクト全期間を通じて、これらの課題に取り組み、半年ごとの合同モニタリングにおいて各課題を振り返りその進捗をモニタリングしてきた。以下、各課題について第 1 期に整理した概要とプロジェクト終了時時点での状況を記す。

5.1.1 プロジェクト実施・運営上の課題

(1)　トレーナーの能力・意識

プロジェクト開始当初、専門家の観察では、一部の技術分野については EWTI トレーナーの実技能力は不十分で、彼らの実技能力の向上は EWTI にとって緊急かつ深刻な課題であることが判明した。しかしながら、EWTI において実技能力強化のための実践機会は限られており、トレーナーの能力強化のためには、実践経験の機会提供が極めて重要であることが分かった。

第 1～2 期に実施した技術分野の能力強化研修では、EWTI トレーナーの実技能力向上のみならず、彼らの学ぶ姿勢にも好影響を与えた。また、パイロット研修の準備や実践を通してトレーナーたちは能力強化研修で学んだ知識と技術を活用し、更に技術に磨きをかけ自信をつけることができた。エンドライン調査によれば、プロジェクト開始時の 2017 年に技能認定証（COC）を取得している技術職員は 2 名だったのに対し、2024 年には COC 取得者は 32 名となっていた。EWTI マネジメントがトレーナーの技術強化を奨励し、技能検定の受験を促すなど一定の努力をしていることがうかがえる。

長期的な対応としては、EWTI がトレーナーに対し、プロジェクト終了後も継続して実践経験を積む機会（内部研修、OJT など）を提供し続けることが重要であり、更に、努力して実技能力を高めた職員に対するインセンティブ向上など組織としての対応が求められる。実践経験は、必ずしも組織された「研修」を実施する必要はなく、ワークショップにある実機や壊れた機械を教材として、解体や組み立ての練習を繰り返すことで積むことができる。他機関から依頼される掘削作業の現場での経験を重ねることもできる。EWTI には充実した機械ワークショップや多数の機材が存在し、その利点を活かす可能性は十分あると考えている。大きなコストをかけずにできる方法を工夫し、EWTI マネジメントが組織的にトレーナーの技術強化や相互学習を促す働きかけが必要と考える。また、収入活動が可能となれば、更に実践経験の機会が増えると期待したい。

(2)　研修評価と COC

ベースライン調査などを通して、プロジェクト開始当初、EWTI が実施する研修において研修生の「学習効果」は実質的に測定されておらず、参加者の研修修了は出席率のみで

評価・判定されていることが判明した。研修全般の印象や各トレーナーの評価、研修生への学習効果（知識、技術の習熟度）の測定は行われていなかった。コース別のプレテスト、ポストテストは、研修の初日と最終日に実施され、その結果は、研修中に教室内の進捗表に掲示される以外は、活用されておらず、記録も残っていなかった。

研修効果の測定は、アウトカムベースの研修を奨励する国の職業訓練の政策や、EWTIとしての方向性に合致しており、専門家チームは、パイロット研修を通して研修参加者による研修評価（研修内容やトレーナーなどの評価）、研修の単元ごとの学習評価（研修参加者の学習目標達成度や実技能力の評価）を標準の研修実施運営の手順と研修カリキュラムに組み込む活動を行った。研修評価においては、研修実施中の日例、週例レビューやコース最後のレビューは全ての研修コースにおいて必須の手順としてガイドラインで規定された。また、学習評価は、単元ごとの LAP テストによる実技能力試験と、モジュールごとの Post test（筆記試験）によって行われるようになった。各研修生の研修修了はこれらの試験結果を基に個別に評価されることが徹底され、標準化された教材（TTLM）の内容に含まれることとなった。

プロジェクトの第 1 期時点で、EWTI では、全ての長期・短期研修コースを TVET のカリキュラムのフォーマットに統一する方針を明確にしており、専門家チームは、少なくとも EOS で標準化された職業においては、TVET カリキュラムの各単元（UC: Unit of Competence）との関連性を明確にする必要があると考えた。

本プロジェクトにおいて対象とした技術分野の中で、EOS で標準化された職業は、EMMT と DT の 2 分野であったが、EWTI は EOS の存在しない、全てのコースにおいて EOS に沿った、もしくはそれに準ずる研修モジュールを作成する方針を明らかにし、ガイドラインに明記した。

しかしながら、プロジェクト期間中に EWTI の組織再編成の過程で EWTI は技能検定（Competency assessment）にかかる業務を手放し、職業訓練とは一線を画す方向に舵を切りつつあり、職業訓練や EOS と EWTI での研修の関係については、整理が必要であると考える。詳細は不明だが、2015/16~2019/20 年の 5 か年計画上では技能検定の実施に関する目標が明記されていたが、2019/20~2024/25 年の 5 か年計画からはその目標は消去されている。

5.1.2　上位目標の達成にかかる課題と対処方針案

(3)　既存資機材の老朽化と掘削技術要員

プロジェクト開始当時、EWTI にある資機材の多くは、EWTEC プロジェクト期間に調達、供与されたもので、掘削機に関しては YBM 社製（2010 年供与）と Schramm 社製の 2 台があったが、その内 Schramm 社製（1999 年供与）のもしか稼働していなかった。同掘削機は老朽化が激しい上にパーツのストックはほぼ皆無で、機械の故障が直ちに研修の不可に繋がる脆弱な状況となっていた。また、老朽化した掘削機を使用していることに関し、研修生を送り出す地方の掘削公社などから、「使用している機械が古すぎて研修が十分役立たない」などのコメントも聞かれた。2010 年に供与された YBM 社製掘削機は、数年間で故障した後、未整備のまま放置されていた。

プロジェクトでは、トレーナーの能力強化研修の一環として故障していた YBM 社製掘削機の点検整備を行い、2019 年 11 月、同機は稼働可能な状態に回復し、掘削研修に使用されるようになった。他方、YBM の稼働再開とほぼ同時期に Schramm 製の掘削機は故障し、修理不能のため廃棄処分となることが決定した。

本プロジェクトは 2020 年、EWTI へ新しい掘削機及び支援車両の供与することとなり、2022 年 10 月、掘削機（TOP750）及び車載型コンプレッサーなどの支援車両と共に EWTI に引き渡された。

他方、第 1 期終了時において掘削技術関連要員は現在上級掘削技術者、チーフドリラー、アシスタントドリラー各 1 名とワークショップ管理者 1 名しかおらず、掘削監督、チーフドリラー、ドリラー、アシスタントドリラー各 1 名（計 4 名）が空席となっていた。専門家チームは、プロジェクト期間を通じて掘削要員の増員と少なくとも掘削チーム 2 チーム体制を組める増員の必要性を訴え続け、EWTI も努力を続けたが、新規雇用しても給与等主に待遇面での理由で人材が定着しないという状況が続いた。プロジェクト終了時において、定年退職後暫定的な契約関係で勤務する技術者 1 名、掘削監督 1 名、ドリラー2 名、ワークショップアシスタント 1 名と、第 1 期とさほど変わらない陣容となっている。給与等待遇面での魅力が無く、構造的な課題の改善も含め、体制強化への一層の努力が求められる。

(4) 機構の位置付けと役割

EWTI ではプロジェクト開始当初は 13～15 程度、現在では年間 50 を超える短期研修を実施しているが、長期研修の提供は EWTI 設立時の政府規定 No 293/2013 でも規定された組織の義務となっている。

プロジェクト開始前に、EWTI が計画していた研修提供のスコープは以下のとおり（2013 年 EWTI パンフレットより、本プロジェクトに関連するコースのみを抜粋）。

表 5-1：EWTI の研修コースがカバーするレベル（EOS 対応）

コース名	レベル[23]				
	1	2	3	4	5
掘削技術	✓	✓	✓	✓	
電気機械整備技術	✓	✓	✓	✓	

*地下水探査コース、掘削機械整備コースは EOS が存在しない。
*青色部分は、TVET でカバーされているレベル[24]。

プロジェクト開始当初、プロジェクトで取り扱うパイロット 4 分野（地下水探査、掘削

[23] *教育省の「国家職業訓練技能枠組み（National TVET Qualifications Framework）」によって定められた技能レベル。分野によって EOS でレベル別の技能が定められているが、概して、以下のように説明できる。レベル 1：指導者の指導の下に業務を補佐できる、レベル 2：指導者の監督下で業務を遂行できる、レベル 3：独立して一定の業務を遂行できる、レベル 4：通常業務の監督ができ、自己および部下の管理ができる、レベル 5：関連する業務全般の開発・管理ができる。*

[24] *TVETC の電気機械整備コースでカバーしているレベルは、レベル 4 までが 4 校（マイチョウ、アソサ、ハワサ、ジジガ各校）、レベル 3 までが 1 校（メルカウェレル）、レベル 1 のみが 1 校（バハルダール）となっている。残りの 3 校（アセラ、コンボルチャ、ウォリソ）は同コースを開講していない。*

技術、掘削機械整備、電気機械整備）における EWTI の短期研修のカリキュラムは、EWTEC プロジェクトで作成したものをほぼ踏襲していたが、それらは EOS に沿って開発されたものではなく、EOS で定められた特定の技術レベルを満たすことを目指したものではなかった。一方、当時は国内 9 カ所の Water-TVETC の内、6 校の TVETC で最高レベル 4 までの電気機械整備のコースが開講されていた（脚注 23 参照）他、アセラにある Kanenisa Poly Tech College では掘削技術コースが開講されていた（レベル 1～3）。ベースライン調査等で確認したところ、民間セクターでプロジェクトが取り扱う技術 4 分野の研修を定期的に提供している機関は不在であった。

上記のような状況を踏まえ、専門家チームは、EWTI と TVETC の教育分野の棲み分けをし、EWTI の差別化を図っていく必要があり、実践的な研修提供ができる研修機関という差別化された EWTI としての価値を売りにして、組織としての自立・拡大を図っていくべきだと考えた。

プロジェクト期間中に状況は変わった。一時は長期研修の開始を強く求めていた水エネルギー省からのプレッシャーは緩和され、TVET で実施されていた掘削技術のコースは閉講された。一方、特にコロナ禍以降は政府機関、国際機関や NGO からのオンディマンド研修のニーズが格段に増加した。EWTI はこのような周囲の要望に組織的に応えるための制度面や財政手続き等の整備を急ぐ必要がある。同時に EWTI の最大の強みである「実践的な技術研修」の質を担保するため、プロジェクトを通して強化してきた組織内での研修評価や運営管理の維持向上に期待したい。

(5) 外部トレーナーの活用

プロジェクト開始当初、ベースライン調査で明らかとなったとおり、パイロット研修の対象となる 4 分野においては、外部トレーナーが担当する講義時間の比率が 17～60%となっており、どの分野も外部トレーナーなしにはフルスケールでの実施は困難であった。プロジェクトでは、トレーナー向けの能力強化研修を実施済みであり、ローカル専門家（多くは EWTEC の元関係者）を外部トレーナーとしてプロジェクトが直接契約する形で投入した。

エンドライン調査によれば、EWTI が雇用する外部トレーナーの数は、2017 年から 2024 年までの間に 7 名から 1 名に減少している。プロジェクトの対象となった技術分野についても、EWTI トレーナーが担当する部分は顕著に増加し、外部トレーナーに頼る部分が減少した。例えば、発電機維持管理コース（電気機械整備）では、研修の 16.67%を外部トレーナーに依存（ベースライン調査）していたところ、第 3 回パイロット研修（2020 年）では、外部トレーナーへの依存度は 0%となった。

また、パイロット研修やガイドライン策定過程において、外部トレーナーの要件や役割を明確に規定し、外部トレーナーはガイドラインに沿って、EWTI が定める標準の研修教材を用いた研修を実施する義務があること、また研修は組織的に管理されることが定められた。

但し、増加傾向にあるオンディマンド研修については、厳密にガイドラインに沿った研修運営管理が実施されているか不明であり、外部トレーナー管理や外部トレーナーによ

る研修の質管理についても今後整理が必要であると考えられる。ガイドラインでは、外部トレーナーはEWTIのオリエンテーションに参加し、研修運営管理ガイドラインを理解する必要がある（ガイドライン 2.5.2）と記載されているが、オンディマンド研修の管理は大きくコースリーダーに依存しており、コースリーダーがドナーに雇用されている外部の人材である場合もあり、十分に管理していないケースも散見される。EWTI マネジメントは状況をある程度把握しているものの、多忙で管理しきれないというのが実情である。

(6) 産業界との連携

上記(1)項で述べたとおり、実技能力を向上させるためには、実践経験を積むことが重要である。EWTI では、短期研修コースにおいて実技演習を取り入れ、研修参加者に実務（模擬）体験をさせる機会を提供しているが、EWTI で提供する研修において、短期間で身につけられる技能は限られている。研修を真の意味で業務に貢献する技術の向上につなげるためには、参加者が研修で学んだ実技を実践する場をインターン制度などでできる限り多く得ることが必要である。

TVET システムにおいては、職業訓練機関と産業界の連携の重要性を謳っており、定期的な TVET と産業関係者との会議や中長期の OJT の場の提供など、産業界との連携を活発に行っている。EWTI においても、先方から依頼された技術サービスの提供などその場限りの関係ではなく、インターン制度整備など長期的視点に立った産業界との連携の在り方を考えていくべきであろう。

EWTI では四半期ごとにステークホルダー会議を実施し、顧客のニーズを把握し産業界の連携強化、情報交換の場を作っていたが、2020 年以降、コロナ禍や国内情勢の不安定、予算不足などの理由で同会議は実施されていない。2024 年 7 月、本プロジェクトの最終セミナーと同時開催でステークホルダー会議を実施したが、これを機にステークホルダーとの関係の再活性化、連携強化に期待したい。

5.1.3 組織運営の持続性にかかる課題（プロジェクト範囲外の課題）

(7) 収入活動

EWTI における収入活動とその利益の還元は、以前から組織として存続する必要事項として認識されてきた。しかしながら、現行の制度では、EWTI は研修にかかる料金等を直接受け取ることはできず、得た収入は財務・経済協力省への入金として扱われ、組織に還元することはできない。この制約が大きな足かせとなり、EWTI の持続性に関わる一つの課題となっている。

収入活動が不可能なために、課題となっている事項には以下のようなものがあると考えられる。

- トレーナーのモラルの低下：うまくいかなくても収入は減らないし、上手くいっても収入は増えないのが現状。実技研修においては、失敗の許される模擬的なシ

チュエーションを研修生に提供すれば十分と考えられ、実践現場で必要とされる職業上の責任はトレーナーに与えられないため、緊張感がない。

- 離職率の高さ：給与が低く抑えられている上に、出張費以外の追加収入は期待できず、収入の良い仕事が別にあれば簡単に離職する。
- トレーナーの実務能力の低さ：大学卒業後に企業等での実践を経ず入職するトレーナーなど、もともと実務経験が少ない上に、EWTI では実践経験を積む機会がないため、実務能力を向上させるのが困難である。

これまでのカウンターパートとの話合いや、組織再編成の際に協議された EWTI の将来像の資料などを参考に考察した結果、制度的に収入活動が可能になることで、以下のような利点があると考えられる。

- 研修トレーナーの実務経験機会の増加
- 実務に取り組むことにより生じるトレーナーの責任感や職業意識の向上
- 上記の要素に伴う研修内容の充実と質の向上
- 実務に伴う収入向上（組織が貢献者に還元した場合）
- 組織としての収入と、収入に伴う事業拡大の可能性

収入活動についてはプロジェクト支援の範疇外であり、介入しない方針であった。しかし、EWTI が収入活動の実現に向け大変前向きであったこと、JICA が EWTI に対する次期支援に関する前提条件として収入活動の実現を挙げたことなどから、プロジェクトはビジネスプラン策定を側面的に支援してきた。結果、2021 年 9 月に EWTI はビジネスプランを水エネルギー省に提出、度重なる補足や改訂の過程を経て 2022 年 10 月には、水エネルギー大臣から同プランへの承認が下りた。現在は、財務省からビジネスプランに添付されている収入の組織内還元ガイドラインの承認を待っている状態。加えて内閣閣僚会議（Council of Ministers）にて EWTI の権限変更への承認が得られれば、収入の組織内還元が可能となる。残念ながら、プロジェクト期間中の実現には至らなかった。

(8) 資機材調達

技術研修には、各種機械や工具が整備された状態で存在することに加え、燃料や交換パーツ、建設資材など様々なアイテムが必要となる。これらの必要アイテムには、適切な時期に適切な数量が揃わなければ、研修自体ができない、もしくは著しく研修の質を低下させるものも多数含まれている。

政府予算執行にかかる様々な制限、会計コードの変更困難など、法的制約や政府の方針で物品の購入や各種活動が制限されている。特に深刻なのは、外貨での物品調達がほとんど不可能という状況である。国内で調達不能なパーツや資材などについては、外貨不足などの理由で許可が下りず、外国の支援に頼らざるを得ない状況である。掘削機械や電気機械など、外国から輸入した機材の整備には、交換パーツの入手が不可欠で、例えば現在 1 台のみ稼働している掘削機械が故障した場合、パーツ不足により整備ができなければ、研修の実施は不可能となる。今後、自立した研修機関として EWTI が存続するためには、

パーツの入手経路の確保、外貨での調達が可能となる仕組みが不可欠な要素であると考える。

残念ながら、この課題についてプロジェクト期間中にほとんど進展が見られなかった。本課題は、EWTI という一組織のみで解決できるものではない。EWTI を含む関係者が時間をかけて政策対話を進め、エチオピア政府として今後の方針を決定してもらうしか方法はないと考える。EWTI が研修機関としてその存在感を高め意義を認められることが一つの方策と考えられるため、EWTI の管理職が中心となって、組織としてこの課題の重要性を理解し、長期的な取り組みを行うことを期待したい。

第 1 期に抽出した課題とその対応策案、第 3 期末時点での進捗を下表に取りまとめた。

表 5-2：EWTI の課題とプロジェクト終了時までの進捗進捗概要

課題	プロジェクトが支援したこと	達成度	2024 年 6 月までの進捗	状況の変化など特筆事項
プロジェクト実施・運営上の課題と対応策				
トレーナーの能力・意識	プロジェクトで提供する研修機会の活用促進 能力強化研修を通したトレーナーの意識向上への働きかけ	4	- 能力強化研修の実施（掘削機械整備、電気機械整備、泥水掘削、揚水試験） - -掘削機械整備分野のリーダーは空席のまま。研修は外部トレーナーがコンプレッサー研修のみを実施中 - ID の考え方を取り入れ TTLM が大きく改善 - トレーナーへの COC 試験の受験促進がなされた	- 能力強化研修の対象となったカウンターパートの内泥水掘削の中心人材が離職 - 国内の経済難等により金銭以外のインセンティブ維持は困難
研修評価と COC	- 研修評価方法及び研修修了認定方法の改善、標準化 - EOS、COC にかかる情報収集・整理	5	- セルフチェック、LAP テストの導入を徹底 - 評価結果を反映させて研修の修了証を発行することを研修運営管理ガイドラインに明記	- EWTI は TVET との差別化に関心が高く、COC との連携は奨励されなかった
上位目標の達成にかかる課題と対処方針案				
既存資機材の老朽化と掘削技術要員	- 掘削機等機材調達業務支援 - 掘削 OJT 実施 - 機材メンテナンスチーム設置支援及び能力強化支援	4	- 能力強化研修で YBM 掘削機を整備 - 掘削機 TOP750 を供与した - 掘削チーム要員に 4 名の増員があったが、2 名は配置後すぐ離職。職員の定着と技術維持向上には課題あり。 - 機材メンテナンスチームが設置された	- 増員した職員の定着率は低い
機構の位置付けと役割	- TVET 研修に関する情報提供、EWTI 研修の差別化（例：EWTI 独自の TTLM 標準作り） - 関係者との対話促進機会の促進	4	- ガイドライン作成過程において、EWTI の研修の位置づけについて協議 - コロナ禍での緊急対応で高い評価 - オンディマンド研修の需要増加 - 各種広報活動	-

外部トレーナーの活用	ガイドラインで外部トレーナーによる研修内容の監督方法の標準化	3	－第 3 回パイロット研修以降、外部トレーナーのカバーする範囲が減少 －コロナ禍以降、オンディマンド研修の増加の一方、管理は十分とは言えない	－オンディマンド研修の需要増加により、内部トレーナーのインセンティブ向上に貢献した可能性
産業との連携	ステークホルダー会議における議論 OJT などで協力可能な機関への働きかけ・連携支援	3	－NRRTC との協力による井戸建設・揚水試験の実施。連携活動への教訓が得られた。 －水エネルギー省からの依頼による井戸掘削・リハビリテーションの案件多数に対応 －オンディマンド研修やドナーからの研修・コンサルティング依頼が増加	－オンディマンド研修の需要増に伴い、収入が組織内還元できない制度面の問題が表面化
組織運営の持続性にかかる課題（プロジェクト範囲外の課題）				
収入活動	収入活動に関するコンサルテーション	5	－ビジネスプラン、収入還元にかかるガイドライン作成・提出完了 －EWTI の責務権限変更による収入の還元について承認待ち状態が続く	－
資機材調達	必要資機材支援（限定的） 国内調達が可能な資機材調達先のリスト化	1	－国内調達が可能な資機材において、組織的な努力が見られたが限定的 －財務局の能力不足が顕著	－

5.2 第 3 期末時点で残された課題と今後に向けた提案

(1) 掘削機械整備分野の人材不足

掘削機械整備分野に配置されているカウンターパートが人数、能力とも不十分であることについて、プロジェクトチームは再三 EWTI 側へ改善の申し入れを行ってきた。同分野は EWTI の研修分野の中でも他機関での研修の機会が少なく、目玉となる分野であり、実践能力のある人材が配置されることが望ましい。

第 1 回パイロット研修で実施したエアコンプレッサー整備研修においては、エンジンの構造を教える初めの数日間以外は外部トレーナーが研修を担当し、研修コースの後半では、担当する EWTI 側のコースリーダー（トレーナー）が国外出張の準備に追われてほとんど研修のモニタリングを行っていないという状況であった。第 2 回パイロット研修においては、コースリーダーとなる人材が配置されず、パイロット研修自体の実施を見送ったが、この状況はプロジェクト終了まで改善されなかった。

EWTI では、掘削機械整備の研修コース実施を強く望んでおり、同分野の強化の必要性については認識されている。しかし、EWTI の人材募集に応じる人材は少なく、人員補填は行われない状況が続いている。掘削機械整備に必要な油圧システムの知識や技術を持つ人材は国内に少なく、また、EWTI の給与体系が相応の人材に魅力的でないなどの要因があると考えられる。

この状況は打開するためには、EWTI が待遇面、仕事の充実度などの面で十分魅力的で

あることが必要で、質の高い人材を抱える職場環境が必要であろう。そのためには、収入の組織内還元が制度的に認められ、組織内で持続的な環境改善に取り組む体制が整えられることが望ましい。

(2) 機材メンテナンスチーム

プロジェクト活動を通して、EWTI では研修に必要な機械や備品の整備ができておらず、研修時に必要な機材を使用できないケースが頻発していた。事態を深刻に見たプロジェクトチームは事態の改善を EWTI マネジメントに訴え、2019 年 1 月、EWTI 総裁の主導で「機材メンテナンスチーム」が発足することとなった。

同チームは、当初、チーム要員の能力強化を主目的として暫定的に招集されたが、プロジェクトチームと EWTI マネジメントは、同チームを組織内の機能として公式に位置づけ、将来にわたって機材の点検整備や、内部人材への技術指導（内部研修）、加えて EWTI の研修コースでの実技指導を行う部署として位置づけ、TOR が策定・承認された。

しかしながら、チームの構成員が 3 つの異なる部局から選定されており、チームへの業務命令系統や評価をどうするかという構造的な問題に加え、構成員のインセンティブをどうするか、予算が絡む物品調達手続きや責任の所在など、実施上の課題も多くあり、残念ながら機材メンテナンスチームによる機材の定期点検・整備を 6 カ月継続するというプロジェクトの目標には到達できなかった。

EWTI マネジメントが機材の継続的なメンテナンスの重要性に気づいた点は評価できるが、組織的に十分な体制を整え、機材整備に必要な予算措置を行うことができなかった点については、大きな課題が残る。新しい EWTI の組織体制には、機材の維持管理を担う部署（掘削機械整備技術研修とコンサルティングデスク）が設置される計画になっている。今後の改善に期待したい。

(3) 収入活動と組織内還元

EWTI の自立のためには収入活動の実施と収入の組織内還元が必要だと認識されて（JCC3、2018 年 4 月）から 6 年が経過している。2022 年 10 月、ビジネスプランは水エネルギー省大臣に承認されているが、その後も財務省から収入還元の認可は下りていない。

一方、コロナ禍を経てますます需要の増大するオンディマンド研修は EWTI の研修事業の主要な活動のひとつであると同時に、研修を支えるスタッフのインセンティブとなっている。残念ながらプロジェクト期間内に収入活動開始とはならなかったが、今後 EWTI が自立した組織として国内の研修需要に応え、責任感を持って研修の質を維持向上させる組織として育っていくよう、期待したい。

第6章　PDM 外の活動について

6.1　背景

2020 年 3 月、エチオピア国内で初めての新型コロナウィルス感染者が確認され、その後、厳しい行動制限を含むウィルス感染対策、感染者や接触者への対応を余儀なくされ、プロジェクトの活動は大幅に制限される状況が続いた。プロジェクトは、そのような状況下、日本人専門家の安全を第一にしつつも、エチオピア人に寄り添い、その時点で最もエチオピアのためになるプロジェクトの活用方法について考え、JICA エチオピア事務所と密に連絡を取りながら、最善の方法を模索し、実行してきた。新型コロナウィルスという一時は世界中を震撼とさせた未知のウィルスへの恐怖、エチオピア国内で初めの感染確認が日本人であったことによる偏見や差別的な扱いなどとも対峙しながら、その時々で最善と思われるプロジェクトの貢献について提案し、活動を継続した。以下 6.2 項には、プロジェクト PDM 外の活動記録を記す。

新型コロナウィルスへの対応支援の一環で、供与機材として掘削機及びツールス一式、支援車両などが供与されることになった。長年、EWTI 側も機材の更新を強く望んできたため、また、EWTI の持続可能な組織運営のために必要な収入活動に貢献するアセットとして、掘削機等の供与は大変歓迎された。プロジェクトは掘削機の供与と、その掘削機を用いた井戸掘削 OJT が終了するまで延長されることになった。

しかしながら、掘削機を使用した井戸掘削 OJT を開始後まもなく、掘削機の不具合があり、プロジェクトで点検や整備を対応することとなったため、プロジェクトの期間の延長や専門家の追加投入を行った。

6.2　新型コロナウィルス対応

(1)　コロナ禍におけるプロジェクトの立ち位置と対応

エチオピア国内で新型コロナウィルス感染が初めて確認された 2020 年 3 月当時、日本人専門家は 3 名現地での活動に従事中であった。

専門家チームは、遠隔で支援可能な活動について考え、以下のことを実施した。

① 水エネルギー省で設置された緊急対策委員会への参加：オンラインで同委員会設置当初は毎日、その後毎週実施されていた水関係者（政府機関、ドナーなど）の会議に参加し、EWTI が実施できることについて検討。

② 3 月 22 日の世界水の日イベント資源（広報グッズ、資金）の活用：EWTI（及び専門家）が中心メンバーとして準備中だった世界水の日のための資源を緊急支援に役立てる方法を提案し、取りまとめ役を担った。世界水の日イベントのために各ドナーが投入を約束していた広報グッズ（T シャツ、バッグなど）を検疫施設や緊急対応スタッフに寄付。資金の一部を手指消毒液や石鹸の購入に充てるなどの支援をアレンジした。

(2) EWTI による緊急的支援への協力

1) EWTI の緊急クルー派遣支援

EWTI は水エネルギー省（旧水灌漑エネルギー省）からの依頼を受けて配置した新型コロナウィルス対策の緊急クルーを派遣した。クルーには①井戸リハビリテーション、②検疫施設等の水道システム整備、③アディスアベバ周辺都市の給水施設における電気機械整備の 3 チームがあり、それぞれ各地での活動を行う予定であったが、②の水道システム整備については、検疫施設へのアクセスが困難であり、緊急対応を実施できなかった。具体的な活動は以下の通り。

③ 井戸リハビリテーション：オロミア州スルルタ、ブラユ、メキ、ドゥカム各地で合計 8 か所、給水源となる井戸のリハビリテーションを実施した。プロジェクトは、リハビリテーションに必要な掘削機用燃料費の支援を行った。

④ 水道システム整備：検疫施設における水道システム整備を実施予定であったが、施設へのアクセスが極めて困難で、プロジェクト支援による派遣は行われなかった。

⑤ 電気機械整備：EWTI の研修業務と連携した発電機等の整備を実施。プロジェクトでは整備作業に必要な機材の一部（ヒートガン）を支援。

2) 手洗い促進支援

EWTI は、水エネルギー省（旧水灌漑エネルギー省）からの依頼を受け、主にアディスアベバ市内の公共の手洗い場設置のために、フットペダル式の手洗いユニットを製造し、合計 10 カ所にユニットを設置した。

また、JICA エチオピア事務所と連携し、手洗い促進のため、手指消毒液をアディスアベバ市内の小学校等向けに配布するため、5 つのサブシティ向けに供与した。また、供与後のモニタリングを実施し、全ての小学校において、手洗い奨励が行われていることを確認した。

消毒液の供与に合わせ、消毒液の使用法や取り扱い方法を説明する教員用及び児童用のポスターをそれぞれ作成し、印刷・配布した。支援実績は下表の通り。

表 6-1：アディスアベバ市内小学校向け手指消毒液供与実績

No.	譲渡先	支援内容
1	キルコス・サブシティ教育事務所	手指消毒液（500mlx240 個，1,000mlx1,160 個） 詰め替え用手袋、消毒液取の使用法・取扱い法ポスター（教員用、児童用）
2	アラダ・サブシティ教育事務所	同上
3	ボレ・サブシティ教育事務所	同上
4	グラレ・サブシティ教育事務所	同上
5	コルフェ・ケラニヨ・サブシティ教育事務所	同上

(3) EWTI 構内の給水システム改善支援

井戸掘削 OJT で掘削した井戸を活用して EWTI 構内の給水システム改善を行った。プロジェクトでは、揚水ポンプの供与、井戸から既存の貯水タンクを繋ぐ送水管などの資材調達を支援した。EWTI 側が工事のための人材投入、技術監督を行い、2024 年 4 月、給水システム改善は完了した。

6.3 課題と教訓

(1) 緊急時における技術協力プロジェクトの存在意義、プロジェクトへの影響

2020 年 3 月、文字通りある日を境に突然プロジェクトの活動ができなくなった。当時現場で活動していたプロジェクト専門家のうち、2 名は自己隔離を余儀なくされたためだった。当時、プロジェクトが主に力を入れていた活動は 2 つ。3 月 22 日前後に予定されていた「世界水の日」イベントを EWTI 主体で実施するための準備と、機材メンテナンスチームの OJT として実施中であった YBM 掘削機の点検整備であった。

突然、EWTI への出勤もできない状況となり、感染の恐れに加え、周囲の関係者へのハラスメント的な行為の対象となった。自己隔離となった専門家 2 名は隔離後の帰国を待つ間、現地にて業務を継続した。

電話やメール、当時はそれほど普及していなかったオンライン会議ツールを駆使し、遠隔で既に手配済みだった世界水の日イベント用の広報グッズのフォロー、イベント関係者、特に共同スポンサーとなっていた関係者との連絡・調整などを行いながら、広報グッズや集めた資金をコロナの緊急対応に活用できないか調整を進めた。

一方、水エネルギー省で立ち上がった緊急対応のための緊急対策委員会（オンライン）に継続的に参加し、各地の感染状況や医療体制、緊急対応の必要性と各ドナーが実施可能な支援などについて頻繁に情報交換を行っていた。

世界中の人々が未体験の状況に見舞われ、感染の恐怖と闘いながらも、エチオピアの地に活動拠点を持ち、エチオピア関係者と関係を持っているプロジェクトの存在意義について、深く考えさせられる体験であった。JICA との契約上、約束した活動内容を進める通常の業務は継続すべきなのか、それ以上に重要で人々が必要とする活動があるのではないか、エチオピアのパートナーとしてすべきこと、日本人としてできること、人間として取るべき行動、自らの置かれた状況と、社会的立場、手持ちのリソースなどを考慮し、その都度最善と考えられる方法を考えた。一方、「プロジェクト」という枠組みで制限される事項についても考えさせられた。

教訓として心に刻んだことの一つは、緊急時においては「行動する」ことが重視されるべきということ。「プロジェクト」という枠や「行動制限」など様々な制約がある中で、行動に踏み出すかどうかを躊躇する場面は多々存在したが、緊急時において、「やってみるリスク」について考える猶予は与えられていないことが多いと考える。世界水の日の広報グッズを緊急対応のために水エネルギー省に供与したこと、世界水の日のために確保した一部資金を活用して手指消毒液や石鹸を同省に供与したことは、プロジェクトとして緊急対応のために行動した初めの活動である。緊急時でフォローアップ活動もままならず、詳細な結果の情報は十分に収集できなかったが、無駄ではなかったと考えている。

次に、コロナ禍のような状況では、情報が最大の武器となること。ドナー会議に頻繁に出席していたおかげで外界とのつながりも確保でき、タイムリーな情報を得ることができていた。JICA 事務所ともほぼ毎日連絡を取り、情報交換や活動にかかる相談を行った。

3 つ目、そして最優先は専門家チームやローカルスタッフの安全確保と心理的サポートである。自己隔離のため対面での会話はできず、生活も全て別空間で行うことになったため、メンバーの健康面や心理面での安全・安心確保については最優先事項とした。一方、物理的に自分も動けないため電話での連絡・相談・雑談などで安全確認や健康状態の確認を行うにとどまった。

添付資料・技術協力成果品

―目次―

添付資料

技術協力成果品

Counterpart List (as of July 2024)

Name	Title	Department
H.E. Dr. Tamene Hailu	Director General	
(H.E. Zenebe Geredew) (left in September 2018)	*Director General*	
Mr.Tamiru Fekadu	Deputy Director General	
Mr.Ajanaw Fenta	Deputy Director General	
Mr.Alemayehu Gudeta	Director	Water Technology Education and Training Directorate (WTETD)
Mr.Girma Demissie	Director	Planning and Information Management Directorate
(Mr.Zewdu Degaga) (left the position in Jan.'19)	*Director*	*Procurement, Finance and Administration Directorate*
Mr.Genene Beyene	Director	Procurement, Finance and Administration Directorate
(Mr.Kibron G.Medihn) (left in September '17)	*Director, Corporate Communication Directorate*	
Mr.Wasihun Alemayehu (left in October 2023)	*Director, Corporate Communication Directorate*	
Mr.Aychiluhim Zenebe (Left the position in Jan.'19)	*Registrar*	
Ms.Abeba Selashi	Registrar	
Mr.Wondimagegn Admasu	Team Leader	Water Supply and Sewerage
Mr.Zewdu Seifu (Left in August '22)	*Expert*	*Water Supply and Sewerage*
Mr.Bezuneh Demissie (left in March 2020)	*Team Leader*	*Groundwater Development and Management & Drilling Technology (GWDM/DT)*
Mr.Nugussie Alemu (left in July '19)	*Acting Dept. Leader / Senior Sewerage Engineer*	*Water Supply and Sewerage*
Mr.Hailemichael Agidew (left in Nov.'17)	*Dept. Leader / sanitary Engineer*	*Water Supply and Sewerage*

Name	Title	Department
Mr.Endalemahu Endale	Team Leader	Electromechanical & Drilling Machinery Maintenance Technology
Mr.Alemayehu Bersisa	Team Leader	Renewable Energy Development Department
Mr.Atkelt Abrha	Training Officer	Water Technology Education and Training Dept.
Mr.Solomon Geteneh	Training Officer	Water Technology Education and Training Dept.
Mr.Biniyam Dereje	Driller	Groundwater Development and Management & Drilling Technology (GWDM/DT)
Mr.Dereje Fekade	Senior Geologist	GWDM/DT
Mr.Mekonnen Awoke	Drilling Superintendent	GWRD/DT
Mr.Mengesha Sisay (left in Nov. '17)	*Senior Geologist*	*GWDM/DT*
Mr.Samuel Zewdu	Senior GIS & Remote Sensing Expert	GWDM/DT
Mr.Zemenu Addis	Senior Hydrologist	GWDM/DT
Ms.Genet Megersa	Junior Geologist	GWDM/DT
Mr.Desalegn Bezabih	Senior Geologist	GWDM/DT
Ms.Asia Ahmed	Junior Drilling Workshop Attendant	GWDM/DT
Mr.Gizachew Getahun	Mechanical Engineer	EM/DMMT
Mr.Gutema Terfassa	Electrical Engineer	EM/DMMT
Mr.Melaku Behailu (Left the position in Jan. '19)	*Senior Mechanical Engineer*	*EM/DMMT*
Ms.Alemwork Gudu	Senior Electrical Engineer	EM/DMMT
Ms.Merima Seid (left in March 2023)	*Technical Assistant*	*EM/DMMT*

Name	Title	Department
Ms.Weyinshet Damitew	Mechanic	EM/DMMT
Mr.Demesa Gelanan	*Technical Assistant*	*Renewable Energy Development Department*
Ms.Worknesh Shenkut	Workshop Assistant	EM/DMMT
Mr.Amare Belay	Driller	GWDM/DT
Mr.Metaferia Demisse	Workshop Maintenenace Head	General Service
Mr.Solomon Terefe	Forklift Operator	General Service
Mr.Habtamu Tesfaye	Design & Construction Engineer III	Water Supply and Sewerage

**GWDM/DT: Groundwater Development and Management and Drilling Technology Department, EM/DMMT: Electro-mechanical and Drilling Machinery Maintenance Technology Department*

PDM

Project Title: Project for Strengthening capacity for training operational management for Ethiopian Water Technology Institute (EWTI) Version 5.1

Implementing Agency: Ethiopian Water Technology Institute Date: Sept. 29, 2021

Target Group: EWTI staff

Period of Project: Five (5) years and eight (8) months from June 2017

Project Site: Addis Ababa, Ethiopia

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal EWTI continues skill development for technicians and engineers with the Project's outputs	1 EWTI continues to conduct training courses based on the guidelines on training operation and management introduced by the Project. 2 EWTI conducts capacity development for EWTI trainers through Internal training	- EWTI's annual report - 5-year strategic plan - Annual training plan	- National roles of EWTI are not drastically changed - Institutional structure of EWTI is not drastically changed due to political effects
Project Purpose EWTI's training operation and management structure is strengthened	1 Guidelines on training operation and management prepared by the project are utilized for the four pilot areas of EWTI training programs 2 EWTI continues to conduct short-term training courses based on the developed learning module and training, teaching and learning materials. ~~3~~ The internal training system is institutionalized (planned, implemented and reported).	- Project reports - EWTI's annual report - Learning module and training, teaching and learning materials	- A lot of EWTI staff who received technical transfer from the Project do not leave EWTI - Institutional structure of EWTI is not drastically changed due to political effects
Output 1. Training management capacity of EWTI is strengthened through PDCA cycle	1-1 Training needs, training evaluation results are reflected to the following annual training plan. 1-2 The results of pilot training are reflected to guidelines on training operation and management. 1-3 International training course is operated and managed by Water Technology Education and Training Directorate (WTETD) once, utilizing the Guidelines for Training Operation and Management.	- Annual training plan - The guidelines on training operation and management version 3	- Natural disaster (earthquake, flooding, etc.) causing drastic damages will not occur. - Security and economic situation in Ethiopia are not drastically worsened than the present situation.
2. Training capacity of EWTI's trainers is enhanced through pilot training courses	2-1 Learning module and training, teaching and learning materials developed by trainers are officially approved. 2-2 Trainers apply the practical knowledge (technical skills and pedagogical skills) gained from the capacity development training in the pilot training. 2-3 More than 70% of trainees achieve the learning outcome set in a learning module at the end of the training course in the Pilot Training Courses, including the international course.	- Learning module and training, teaching and learning materials - TTLM E-learning version samples - Hybrid training design documents - Action plan for preparation of e-learning - Video contents for e-learning - Project reports - EWTI's annual report	
3. Implementation structure of internal training for EWTI's trainers is established	3-1 Internal training materials and internal training plans are prepared and approved. 3-2 More than 80% of participants who attend the internal training courses achieve the learning outcome set in each internal training course 3-3 Training materials for four technical areas (GWDM, DT, DMMT and EMMT) are kept in place. 3-4 Terms of Reference for the Maintenance Team is approved by Director General 3-5 Regular maintenance activities by the Maintenance Team are conducted for more than 6 months based on the TOR for the Maintenance Team.	- Internal training materials (TTLM for TTLM, audio-visual materials) - Internal training plan - Project report - Results of questionnaire survey for participants - Training Completion Reports - TOR for Maintenance Team - Maintenance check sheets - Machinery/equipment maintenance annual plan - Procurement plan	

Activities	Inputs		Pre-Conditions
	The Japan Side	The Ethiopian Side	
1-1 EWTI establishes the Training Management Committee	1. Experts - Chief Advisor / Training Management 1 - Deputy Chief Advisor / Training Management 2 - Curriculum and Training Material Development 1&2 - Groundwater Development / Hydrogeology 1&2 - Drilling Technology 1&2 - Drilling Machinery Maintenance Technology 1&2 - Electro-mechanical Machinery Maintenance Technology 1&2 - Business Management - E-learning - Training Material Development 1&2&3&4&5 - Project Coordinator 2. Training - Training in Japan and third countries (including training cost) - Invitation Programme for high officials 3. Third-country Training (acceptance of trainees from outside Ethiopia) 4 Local cost - Transportation cost for Japanese Expert Team - Expense for workshop and Joint Coordination Committee (JCC) 5 Machinery / materials - Drilling related equipment - Materials for a deep well drilling - Laptop PC	1. Counterpart personnel - Project Director - Project Manager - Director, Planning and Data Management Directorate - Director, Finance Procurement Property and General Service Directorate - Director, Corporation Communication Directorate - Registrar - C/P from each Sub-core Processes 2. Facilities - Office space for Japanese Experts in EWTI (for approx. 5 persons) - Office furniture - Internet connection - Training classroom 3. Local cost - Administration costs of the project (electric power, telephone, internet and water for the Japanese Experts' office) - Salary, per-diem and accommodation for EWTI staff	- Completion of counterparts assignment - Completion of construction of new office building and relevant facilities - Completion of training needs survey conducted by EWTI
1-2 The JICA Experts conducts training courses on introduction of the PDCA concept			
1-3 The JICA Experts and the Training Management Committee grasp current training management challenges of EWTI through base-line survey			
1-4 The Training Management Committee reviews training demand survey conducted by EWTI			
1-5 The Training Management Committee and EWTI's trainers conduct technical-gap finding survey and analyze the result			
1-6 The Training Management Committee formulates annual training plan for the following year based on the results in Activity 1-4 and 1-5			
1-7 The Training Management Committee and EWTI's trainers formulate pilot training courses / international courses scope and implementation structure based on Activity 1-5 and 1-6			
1-8 The Training Management Committee reviews the current recruit and selection methods			
1-9 The Training Management Committee recruits and selects trainees with improved methods through Activity 1-8			
1-10 The Training Management Committee monitors and evaluates pilot training courses / international courses implemented through Output 2, and reviews the training scope and implementation structure			
1-11 The Training Management Committee formulates the guidelines on training operational and management version 1			
1-12 The Training Management Committee and EWTI's trainers repeat activities described from Activity 1-6 to 1-10 twice			
1-13 The Training Management Committee revises the guidelines on training operation and management to version 2 based on the result of Activity 1-12			
1-14 The Training Management Committee shares the guidelines on training operation and management version 3 with EWTI			
2-1 The JICA Expert Team and EWTI's trainers grasp the challenges of EWTI 's trainers regarding training implementation through the baseline survey			
2-2 The JICA Expert Team and EWTI's trainers formulate capacity development plans and clarify the goal of capacity development			
2-3 The JICA Expert Team gives lessons on strengthening instructional design to EWTI's trainers based on the challenges identified in Activity 2-1			
2-4 The JICA Expert Team gives lessons for curriculum formulation based on the challenges identified in Activity 2-1			
2-5 The JICA Expert Team gives lessons for upgrading technical skills to EWTI's trainers based on the challenges identified in Activity 2-1			
2-6 EWTI's trainers formulate learning module and training, teaching and learning materials based on the TTLM manual for pilot training / international courses			
2-7 EWTI's trainers implement the pilot training courses / international courses			
2-8 EWTI's trainers review and improve pilot training contents (learning module and training, teaching and learning materials) based on the results of Activity 1-10			
2-9 EWTI's trainers repeat Activities 2-6 to 2-8			
2-10 EWTI's trainers experience the sample of the TTLM for e-learning and make an action plan for preparation of e-learning at EWTI.			
2-11 EWTI's trainers produce necessary video contents as a part of preparatory activities for e-learning provision.			
2-12 EWTI establishes a platform for E-learning on a Learning Management System (LMS).			
2-13 EWTI's trainer deliver the training utilizing the platform established through the activity 2-12 above at least in one technical training course.			
3-1 EWTI establishes Internal Training Team to transfer the knowledge acquired through Output 2 activities to other trainers			
3-2 Internal Training Team decides the contents of internal training for other trainers			
3-3 Internal Training Team formulates training materials based on the result of Activity 3-2			
3-4 Trainers, who got capacity development through the Project, implement internal training courses to other trainers			
3-5 Internal Training Team formulates the internal training report to Director General			
3-6 Internal Training Team formulates internal training plan for the following year			
3-7 EWTI assigns appropriate section to be in charge of knowledge management.			
3-8 The authorized section in the Activity 3-7 systematically maintains the training resources in database.			
3-9 The Maintenance Team regularly checks the function of the machinery/equipment for training and submits the report to the relevant authority.			
3-10 EWTI management staff critically reviews the report prepared by the Maintenance Team and takes necessary actions.			

Version April 29, 2019

Comparison Table of PDM Ver.1 / ver.2 / ver.3

***The amended phrases are underlined and coloured.**

No.	Ver.1	Ver.2	Ver.3	Reasons for Amendment from Veer.2 to Ver.3
1	**Project Title** Project for Strengthening capacity for training operational management for Ethiopian Water Technology Institute (EWTI)	**Project Title** Project for Strengthening capacity for training operational management for Ethiopian Water Technology Institute (EWTI)	**Project Title** Project for Strengthening capacity for training operational management for Ethiopian Water Technology Institute (EWTI)	No change
2	**Implementation Agency** Ethiopian Water Technologiy Institute	**Implementation Agency** Ethiopian Water Technology Institute	**Implementation Agency** Ethiopian Water Technology Institute	No change
3	**Target Group** EWTI staff	**Target Group** EWTI staff	**Target Group** EWTI staff	No change
4	**Period of Project** June 2017 – June 2020, three years	**Period of Project** June 2017 – June 2020, three years	**Period of Project** June 2017 – September 2020, three years and three months	It was understood by the stakeholders that an extension of the Project period for three months is relevant as some additional project activities are included; such as the third-country training and strengthening the Maintenance Team.
5	**Project Site** Addis Ababa, Ethiopia	**Project Site** Addis Ababa, Ethiopia	**Project Site** Addis Ababa, Ethiopia	No change
6	**Overall Goal** EWTI continues skill development for technicians and engineers with the Project's outputs	**Overall Goal** EWTI continues skill development for technicians and engineers with the Project's outputs	**Overall Goal** EWTI continues skill development for technicians and engineers with the Project's outputs	No change
7	**Objectively Verifiable Indicators for Overall Goal** 1. EWTI continues to conduct training courses based on the guidelines and manuals on operational procedures for training introduced by the Project. 2. EWTI continues to conduct short-term training courses based on the developed manuals on training teaching and learning materials. 3. EWTI conducts capacity development for EWTI's lecturers through Internal training.	**Objectively Verifiable Indicators for Overall Goal** 1. EWTI continues to conduct training courses based on the guidelines and manuals on training operation and management introduced by the Project. (The indicator related to TTLM is Deleted) 2. EWTI conducts capacity development for EWTI trainers through Internal training.	**Objectively Verifiable Indicators for Overall Goal** 1. EWTI continues to conduct training courses based on the guidelines ~~and manuals~~ on training operation and management introduced by the Project. 2. EWTI conducts capacity development for EWTI trainers through Internal training.	-EWTI developed the guidelines for training operation and management with some templates and formats which are necessary for training operation. A manual along with the guidelines was also attempted, but EWTI found that the contents of the guidelines cover most information that were drafted on the manual. Therefore manual development was consider not a priority.
8	**Means of Verificaiton** EWTI's annual report	**Means of Verificaiton** EWTI's annual report	**Means of Verificaiton** EWTI's annual report	No change
9	**Important Assumption** - National roles of EWTI are not drastically changed. - Institutional structure of EWTI is not drastically changed due to political effects.	**Important Assumption** - National roles of EWTI are not drastically changed. - Institutional structure of EWTI is not drastically changed due to political effects.	**Important Assumption** - National roles of EWTI are not drastically changed. - Institutional structure of EWTI is not drastically changed due to political effects.	No change
10	**Project Purpose** EWTI's training operation and management structure is strengthened	**Project Purpose** EWTI's training operation and management structure is strengthened	**Project Purpose** EWTI's training operation and management structure is strengthened	No change
11	**Objectively Verifiable Indicators for Project Purpose** 1. Guidelines and manuals on operational procedures for training are approved and shared in EWTI through workshop 2. More than 80% of trainees who attend pilot training couses respond that they are satisfied with the contents of the pilt training courses. 3. The internal training plan for the following year and internal training report are approved.	**Objectively Verifiable Indicators for Project Purpose** 1. Guidelines and manuals on training operation and management prepared by the project are utilized for the four pilot areas of EWTI training programs. 2. EWTI continues to conduct short-term training courses based on the developed learning module and training, teaching and learning materials. 3. The internal training system is institutionalized (planned, implemented and reported).	**Objectively Verifiable Indicators for Project Purpose** 1. Guidelines ~~and manuals~~ on training operation and management prepared by the project are utilized for the four pilot areas of EWTI training programs. 2. EWTI continues to conduct short-term training courses based on the developed learning module and training, teaching and learning materials. 3. The internal training system is institutionalized (planned, implemented and reported).	-The same reason as that of Item No.7
12	**Means of Verificaiton** -Project reports and annual reports of EWTI -Results of quetionnaire survey for trainees	**Means of Verificaiton** -Project reports -Annual report of EWTI -Learning module and training, teaching and learning materials	**Means of Verificaiton** -Project reports -Annual report of EWTI -Learning module and training, teaching and learning materials	No change
13	**Important Assumption** -A lot of EWTI staff who received technical transfer from the Project do not leave EWTI -Institutional structure of EWTI is not drastically changed due to political effects	**Important Assumption** -A lot of EWTI staff who received technical transfer from the Project do not leave EWTI -Institutional structure of EWTI is not drastically changed due to political effects	**Important Assumption** -A lot of EWTI staff who received technical transfer from the Project do not leave EWTI -Institutional structure of EWTI is not drastically changed due to political effects	No change

No.	Ver.1	Ver.2	Ver.3	Reasons for Amendment from Veer.2 to Ver.3
14	**Output 1** Training management structure of EWTI is strengthened through PDCA cycle	**Output 1** Training management structure of EWTI is strengthened through PDCA cycle	**Output 1** Training management structure of EWTI is strengthened through PDCA cycle	No change
15	**Objectively Verifiable Indicators for Output 1** 1-1. Annual training plans developed by the Project are approved by EWTI. 1-2. Guidelines and manuals on operational procedures for training version 1. is revised to version 2.	**Objectively Verifiable Indicators for Output 1** 1-1. Training needs, training evaluation results are reflected to the following annual training plan. 1-2. The results of pilot training is reflected to guidelines and manuals on training operation and management.	**Objectively Verifiable Indicators for Output 1** 1-1. Training needs, training evaluation results are reflected to the following annual training plan. 1-2. The results of pilot training is reflected to guidelines ~~and manuals~~ on training operation and management. 1-3. An international training course is operated and mangaed by Water Technology Education and Trianing Directorate more than once.	- Third-country Training Program is incorporated in addition to the planned activities, according to the agreement between JICA and EWTI. The international course will be implemented as a part of the Pilot Training Courses.
16	**Means of Verificaiton** -Annual training plan -The guidelines and manuals on operational procedures version 2	**Means of Verificaiton** -Annual training plan -The guidelines andmanuals on training operation and management version 2	**Means of Verificaiton** -Annual training plan -The guidelines ~~and manuals~~ on training operation and management version 3	-The same reason as that of Item No.7. The guidelines version 2 was changed into 3, as the Project does the revision after the 3rd Pilot Training in addition to the ones planned initially
17	**Output 2** Training capacity of EWTI's trainers is enhanced through pilot training courses	**Output 2** Training capacity of EWTI's trainers is enhanced through pilot training courses	**Output 2** Training capacity of EWTI's trainers is enhanced through pilot training courses	No change
18	**Objectively Verifiable Indicators for Output 2** 2-1. The developed manuals on training, teaching and learning materials are officially approved. 2-2. Lecturers in charge of pilot training courses attains the level of targeted capacity in capacity development plan.	**Objectively Verifiable Indicators for Output 2** 2-1. Learning module and training, teaching and learning materials developed by trainers are officially approved. 2-2. Trainers apply the practical knowledge (technical skills and pedagogical skills) gained from the capacity development training in the pilot training. 2-3. More than 70% of trainees achieve the learning outcome set in a learning module at the end of the training course.	**Objectively Verifiable Indicators for Output 2** 2-1. Learning module and training, teaching and learning materials developed by trainers are officially approved. 2-2. Trainers apply the practical knowledge (technical skills and pedagogical skills) gained from the capacity development training in the pilot training. 2-3. More than 70% of trainees achieve the learning outcome set in a learning module at the end of the training course in the Pilot Training courses, including the international course.	-An international course is incorporated as stated as the reasons for Indicater 1-3 above.
19	**Means of Verificaiton** -Manuals on training, teaching and learning materials -Project reports -EWTI's annual report	**Means of Verificaiton** - Learning module and training, teaching and learning materials -Project reports -EWTI's annual report	**Means of Verificaiton** - Learning module and training, teaching and learning materials -Project reports -EWTI's annual report	-As mentioned in the item No.7, the manuals on TTLM development will not be produced by the Project. The trainers will make TTLM according to the MoE's manual.
20	**成果3** Implementation structure of internal training for EWTI's trainers is established	**Output 3** Implementation structure of internal training for EWTI's trainers is established	**Output 3** Implementation structure of internal training for EWTI's trainers is established	No change
21	3-1. Internal training materials and internal training plan are prepared and approved 3-2. More than 80% of participants, who attend the internal training courses, after a series of the training courses, are satisfied with the contents of the internal training courses	**Objectively Verifiable Indicators for Output 3** 3-1. Internal training materials and internal training plans are periodically prepared and approved. 3-2. More than 80% of participants who attend the internal training courses achieve the learning outcome set in each internal training course.	**Objectively Verifiable Indicators for Output 3** 3-1. Internal training materials and internal training plans are periodically prepared and approved. 3-2. Terms of Reference for the Maintenance Team is approved 3-3. More than 80% of participants who attend the internal training courses achieve the learning outcome set in each internal training course.	- EWTI established the Maintenance Team at the temporary base to strengthen the capacity of maintaining the machinery and equpment necessary for training activities. The function of the Maintenance Team should be strengthened, as a part of internal training.
22	**Means of Verification** -Internal training materials and internal training plan and project report -EWTI's annual report -Results of questionnaire survery for participants	**Means of Verification** -Internal training materials -Internal training plan -Project report -EWTI's annual report -Results of questionnaire survery for participants	**Means of Verification** -Internal training materials -Internal training plan -Project report -EWTI's annual report -Results of questionnaire survery for participants -TOR for Maintenance Team	-Due to the additional indicator (3-2) above (item No.21).
23	**Inportant Assumption for Outputs** -Natural disaster (earthquake, flooding, etc.) causing drastic damages will not occur. -Security and economic situation in Ethiopia are not drastically worsened than the present situation.	**Inportant Assumption for Outputs** -Natural disaster (earthquake, flooding, etc.) causing drastic damages will not occur. -Security and economic situation in Ethiopia are not drastically worsened than the present situation.	**Inportant Assumption for Outputs** -Natural disaster (earthquake, flooding, etc.) causing drastic damages will not occur. -Security and economic situation in Ethiopia are not drastically worsened than the present situation.	No change

No.	Ver.1	Ver.2	Ver.3	Reasons for Amendment from Veer.2 to Ver.3
24	**Activity 1-1** EWTI establishes the Training Management Team	**Activity 1-1** EWTI establishes the Training Management Team	**Activity 1-1** EWTI establishes the Training Management Committee	-Training Management Team was transformed to Training Management Committee as stipulated in The Guidelines for Trianing Operation and Management recently developed.
25	**Activity 1-2** The JICA Experts conducts training courses on introduction of the PDCA concept	**Activity 1-2** The JICA Experts conducts training courses on introduction of the PDCA concept	**Activity 1-2** The JICA Experts conducts training courses on introduction of the PDCA concept	No change
26	**Activity 1-3** The JICA Experts and the Training Management Team grasp current training management challenges of EWTI through base-line survey	**Activity 1-3** The JICA Experts and the Training Management Team grasp current training management challenges of EWTI through base-line survey	**Activity 1-3** The JICA Experts and the Training Management Committee grasp current training management challenges of EWTI through base-line survey	The same reason as Activity 1-1 (item No.24).
27	**Activity 1-4** The Training Management Team reviews training demand survey conducted by EWTI	**Activity 1-4** The Training Management Team reviews training demand survey conducted by EWTI	**Activity 1-4** The Training Management Committee reviews training demand survey conducted by EWTI	The same reason as Activity 1-1 (item No.24).
28	**Activity 1-5** The Training Management Team and EWTI's trainers conduct technical-gap finding survey and analyze the result	**Activity 1-5** The Training Management Team and EWTI's trainers conduct technical-gap finding survey and analyze the result	**Activity 1-5** The Training Management Committee and EWTI's trainers conduct technical-gap finding survey and analyze the result	The same reason as Activity 1-1 (item No.24).
29	**Activity 1-6** The Training Management Team formulates annual training plan for the following year based on the results in Activity 1-4 and 1-5	**Activity 1-6** The Training Management Team formulates annual training plan for the following year based on the results in Activity 1-4 and 1-5	**Activity 1-6** The Training Management Committee formulates annual training plan for the following year based on the results in Activity 1-4 and 1-5	The same reason as Activity 1-1 (item No.24).
30	**Activity 1-7** The Training Management Team and EWTI's trainers formulate pilot training courses scope and implementation structure based on Activity 1-5 and 1-6	**Activity 1-7** The Training Management Team and EWTI's trainers formulate pilot training courses scope and implementation structure based on Activity 1-5 and 1-6	**Activity 1-7** The Training Management Committee and EWTI's trainers formulate pilot training courses / international courses scope and implementation structure based on Activity 1-5 and 1-6	The same reason as Activity 1-1 (item No.24). The term "international courses" was added due to the change made on Output 1 (item No.15)
31	**Activity 1-8** The Training Management Team reviews the current recruit and selection methods	**Activity 1-8** The Training Management Team reviews the current recruit and selection methods	**Activity 1-8** The Training Management Committee reviews the current recruit and selection methods	The same reason as Activity 1-1 (item No.24).
32	**Activity 1-9** The Training Management Team recruits and selects trainees with improved methods through Activity 1-8	**Activity 1-9** The Training Management Team recruits and selects trainees with improved methods through Activity 1-8	**Activity 1-9** The Training Management Committee recruits and selects trainees with improved methods through Activity 1-8	The same reason as Activity 1-1 (item No.24).
33	**Activity 1-10** The Training Management Team monitors and evaluates pilot training courses implemented through Output 2, and reviews the training scope and implementation structure	**Activity 1-10** The Training Management Team monitors and evaluates pilot training courses implemented through Output 2, and reviews the training scope and implementation structure	**Activity 1-10** The Training Management Committee monitors and evaluates pilot training courses / international courses implemented through Output 2, and reviews the training scope and implementation structure	The same reason as Activity 1-1 (item No.24). The term "international courses" was added due to the change made on Output 1 (item No.15)
34	**Activity 1-11** The Training Management Team formulates the guidelines and manuals on operational procedures for training version 1	**Activity 1-11** The Training Management Team formulates the guidelines and manuals on training operation and management version 1	**Activity 1-11** The Training Management Committee formulates the guidelines ~~and manuals~~ on training operation and management version 1	The same reason as Activity 1-1 (item No.24). The term "and manuals" was deleted, for the same reason as the item No.7.
35	**Activity 1-12** The Training Management Team and EWTI's trainers repeat activities described from Activity 1-6 to 1-10	**Activity 1-12** The Training Management Team and EWTI's trainers repeat activities described from Activity 1-6 to 1-10	**Activity 1-12** The Training Management Committee and EWTI's trainers repeat activities described from Activity 1-6 to 1-10 twice	The same reason as Activity 1-1 (item No.24). The term "twice" is added, as it was agreed to implement the 3rd Pilot Training Courses, in addition to the initially planned ones.
36	**Activity 1-13** The Training Management Team revises the guidelines and manuals on operational procedures for training to version 2 based on the result of Activity 1-12	**Activity 1-13** The Training Management Team revises the guidelines and manuals on tranining operation and management to version 2 based on the result of Activity 1-12	**Activity 1-13** The Training Management Committee revises the guidelines ~~and manuals for~~ tranining operation and management to version 3 based on the result of Activity 1-12	The same reason as Activity 1-1 (item No.24). The term "and manuals" was deleted, for the same reason as the item No.7. The guidelines version 2 was changed into 3, as the Project does the revision after the 3rd Pilot Training in addition to the ones planned initially
37	**Activity 1-14** The Training Management Team shares the guidelines and manuals on operational procedures version 2 for training with EWTI	**Activity 1-14** The Training Management Team shares the guidelines and manuals on training operation and management version 2 for training with EWTI	**Activity 1-14** The Training Management Committee shares the guidelines ~~and manuals~~ on training operation and management version 3 for training with EWTI	The same reason as Activity 1-1 (item No.24). The term "and manuals" was deleted, for the same reason as the item No.7. The guidelines version 2 was changed into 3, as the Project does the revision after the 3rd Pilot Training in addition to the ones planned initially

No.	Ver.1	Ver.2	Ver.3	Reasons for Amendment from Veer.2 to Ver.3
38	**Activity 2-1** The JICA Expert Team and EWTI's trainers grasp the challenges of EWTI 's trainers regarding training implementation through the baseline survey	**Activity 2-1** The JICA Expert Team and EWTI's trainers grasp the challenges of EWTI 's trainers regarding training implementation through the baseline survey	**Activity 2-1** The JICA Expert Team and EWTI's trainers grasp the challenges of EWTI 's trainers regarding training implementation through the baseline survey	No change
39	**Activity 2-2** The JICA Expert Team and EWTI's trainers formulate capacity development plans and clarify the goal of capacity development	**Activity 2-2** The JICA Expert Team and EWTI's trainers formulate capacity development plans and clarify the goal of capacity development	**Activity 2-2** The JICA Expert Team and EWTI's trainers formulate capacity development plans and clarify the goal of capacity development	No change
40	**Activity 2-3** The JICA Expert Team gives lessons on strengthening instructional design to EWTI's trainers based on the challenges identified in Activity 2-1	**Activity 2-3** The JICA Expert Team gives lessons on strengthening instructional design to EWTI's trainers based on the challenges identified in Activity 2-1	**Activity 2-3** The JICA Expert Team gives lessons on strengthening instructional design to EWTI's trainers based on the challenges identified in Activity 2-1	No change
41	**Activity 2-4** The JICA Expert Team gives lessons for curriculum formulation based on the challenges identified in Activity 2-1	**Activity 2-4** The JICA Expert Team gives lessons for curriculum formulation based on the challenges identified in Activity 2-1	**Activity 2-4** The JICA Expert Team gives lessons for curriculum formulation based on the challenges identified in Activity 2-1	No change
42	**Activity 2-5** The JICA Expert Team gives lessons for upgrading technical skills to EWTI's trainers based on the challenges identified in Activity 2-1	**Activity 2-5** The JICA Expert Team gives lessons for upgrading technical skills to EWTI's trainers based on the challenges identified in Activity 2-1	**Activity 2-5** The JICA Expert Team gives lessons for upgrading technical skills to EWTI's trainers based on the challenges identified in Activity 2-1	No change
43	**Activity 2-6** EWTI's trainers formulate pilot training contents (training, teaching and learning materials) based on the results of Activity 1-10	**Activity 2-6** EWTI's trainers formulate learning module and training, teaching and learning materials based on the TTLM manual for pilot training	**Activity 2-6** EWTI's trainers formulate learning module and training, teaching and learning materials based on the TTLM manual for pilot training / internaitnoal courses	The term "international courses" was added due to the change made on Output 1 (item No.15)
44	**Activity 2-7** EWTI's trainers implement the pilot training courses	**Activity 2-7** EWTI's trainers implement the pilot training courses	**Activity 2-7** EWTI's trainers implement the pilot training courses / international courses	The term "international courses" was added due to the change made on Output 1 (item No.15)
45	**Activity 2-8** EWTI's trainers review and improve pilot training contents (training, teaching and learning materials) based on the results of Activity 1-10	**Activity 2-8** EWTI's trainers review and improve pilot training contents (learning module and training, teaching and learning materials) based on the results of Activity 1-10	**Activity 2-8** EWTI's trainers review and improve pilot training contents (learning module and training, teaching and learning materials) based on the results of Activity 1-10	No change
46	**Activity 2-9** EWTI's trainers repeat Activities 2-6 to 2-8	**Activity 2-9** EWTI's trainers repeat Activities 2-6 to 2-8	**Activity 2-9** EWTI's trainers repeat Activities 2-6 to 2-8	No change
47	**Activity 2-10** EWTI's trainers make a manual for formulating training, teaching and learning materials based on the result of activities above	**Activity 2-10** Deleted	**Activity 2-10** Deleted	No change
48	**Activity 3-1** EWTI establishes Internal Training Team to transfer the knowledge acquired through Output 2 activities to other trainers	**Activity 3-1** EWTI establishes Internal Training Team to transfer the knowledge acquired through Output 2 activities to other trainers	**Activity 3-1** EWTI establishes Internal Training Team to transfer the knowledge acquired through Output 2 activities to other trainers	No change
49	**Activity 3-2** Internal Training Team decides the contents of internal training for other trainers	**Activity 3-2** Internal Training Team decides the contents of internal training for other trainers	**Activity 3-2** Internal Training Team decides the contents of internal training for other trainers	No change
50	**Activity 3-3** Internal Training Team formulates training materials based on the result of Activity 3-2	**Activity 3-3** Internal Training Team formulates training materials based on the result of Activity 3-2	**Activity 3-3** Internal Training Team formulates training materials based on the result of Activity 3-2	No change
51	**Activity 3-4** Trainers, who got capacity development through the Project, implement internal training courses to other trainers	**Activity 3-4** Trainers, who got capacity development through the Project, implement internal training courses to other trainers	**Activity 3-4** Trainers, who got capacity development through the Project, implement internal training courses to other trainers	No change
52	**Activity 3-5** Internal Training Team formulates the internal training report to Director General	**Activity 3-5** Internal Training Team formulates the internal training report to Director General	**Activity 3-5** Internal Training Team formulates the internal training report to Director General	No change
53	**Activity 3-6** Internal Training Team formulates internal training plan for the following year	**Activity 3-6** Internal Training Team formulates internal training plan for the following year	**Activity 3-6** Internal Training Team formulates internal training plan for the following year	No change
54	**Inputs** **The Japanese Side** 1. Experts - Chief Advisor / Training Management 1 - Deputy Chief Advisor / Training Management 2 - Curriculum and Training Material Development 1&2 - Groundwater Development / Hydrogeology 1&2 - Drilling Technology - Drilling Machinery Maintenance Technology - Electro-mechanical Machinery Maintenance Technology - Project Coordinator / Training Material Production Assistant 2. Training - Training in Japan and third countries (including training cost) 3 Local cost - Transportation cost for Japanese Expert Team - Expense for workshop and Joint Coordination Committee (JCC)	**Inputs** **The Japanese Side** 1. Experts - Chief Advisor / Training Management 1 - Deputy Chief Advisor / Training Management 2 - Curriculum and Training Material Development 1&2 - Groundwater Development / Hydrogeology 1&2 - Drilling Technology - Drilling Machinery Maintenance Technology - Electro-mechanical Machinery Maintenance Technology - Project Coordinator / Training Material Production Assistant 2. Training - Training in Japan and third countries (including training cost) 3 Local cost - Transportation cost for Japanese Expert Team - Expense for workshop and Joint Coordination Committee (JCC)	**Inputs** **The Japanese Side** 1. Experts - Chief Advisor / Training Management 1 - Deputy Chief Advisor / Training Management 2 - Curriculum and Training Material Development 1&2 - Groundwater Development / Hydrogeology 1&2 - Drilling Technology - Drilling Machinery Maintenance Technology 1&2 - Electro-mechanical Machinery Maintenance Technology - Project Coordinator - Training Material Development 1&2 2. Training - Training in Japan and third countries (including training cost) 3. Third-country Training (acceptance of trainees from outside Ethiopia) 4 Local cost - Transportation cost for Japanese Expert Team - Expense for workshop and Joint Coordination Committee (JCC)	- Some additional experts are dispatched (e.g. Drilling Machinery Maintenace Technology 2, Training Material Development 2). Third-country training was added.

Version September 29, 2021

Comparison Table of PDM ver.4 / ver.5.1

***The amended phrases are underlined and coloured.**

No.	Ver.4	Ver.5.1	Reasons for Amendment from Ver.4 to Ver.5.1
1	**Project Title** Project for Strengthening capacity for training operation and management for Ethiopian Water Technology Institute (EWTI)	**Project Title** Project for Strengthening capacity for training operation and management for Ethiopian Water Technology Institute (EWTI)	No change
2	**Implementation Agency** Ethiopian Water Technology Institute	**Implementation Agency** Ethiopian Water Technology Institute	No change
3	**Target Group** EWTI staff	**Target Group** EWTI staff	No change
4	**Period of Project** June 2017 - March 2021, three years and nine months	**Period of Project** June 2017 - February 2023, five years and eight (8) months	Due to the outbreak of COVID-19, the project activities have been restricted and the Japanese Experts have not been dispatched as planned since March 2020. The Project period should be extended with some modification and addition of activities. In addition, JICA decided to donate some heavy duty machinery and equipment to EWTI and the Project needs to strengthen the capacity of EWTI staff for effective utilization of them.
5	**Project Site** Addis Ababa, Ethiopia	**Project Site** Addis Ababa, Ethiopia	No change
6	**Overall Goal** EWTI continues skill development for technicians and engineers with the Project's outputs	**Overall Goal** EWTI continues skill development for technicians and engineers with the Project's outputs	No change
7	**Objectively Verifiable Indicators for Overall Goal** 1. EWTI continues to conduct training courses based on the guidelines on training operation and management introduced by the Project. 2. EWTI conducts capacity development for EWTI trainers through Internal training.	**Objectively Verifiable Indicators for Overall Goal** 1. EWTI continues to conduct training courses based on the guidelines on training operation and management introduced by the Project. 2. EWTI conducts capacity development for EWTI trainers through Internal training.	No change
8	**Means of Verification** - EWTI's annual report - 5-year strategic plan - Annual training plan	**Means of Verification** - EWTI's annual report - 5-year strategic plan - Annual training plan	No change
9	**Important Assumption** - National roles of EWTI are not drastically changed. - Institutional structure of EWTI is not drastically changed due to political effects.	**Important Assumption** - National roles of EWTI are not drastically changed. - Institutional structure of EWTI is not drastically changed due to political effects.	No change
10	**Project Purpose** EWTI's training operation and management structure is strengthened	**Project Purpose** EWTI's training operation and management structure is strengthened	No change
11	**Objectively Verifiable Indicators for Project Purpose** 1. Guidelines on training operation and management prepared by the project are utilized for the four pilot areas of EWTI training programs. 2. EWTI continues to conduct short-term training courses based on the developed learning module and training, teaching and learning materials. 3. The internal training system is institutionalized (planned, implemented and reported).	**Objectively Verifiable Indicators for Project Purpose** 1. Guidelines on training operation and management prepared by the project are utilized for the four pilot areas of EWTI training programs. 2. EWTI continues to conduct short-term training courses based on the developed learning module and training, teaching and learning materials. 3. The internal training system is institutionalized (planned, implemented and reported).	No change
12	**Means of Verification** -Project reports -EWTI's annual report -Learning module and training, teaching and learning materials	**Means of Verification** -Project reports -EWTI's annual report -Learning module and training, teaching and learning materials	No change
13	**Important Assumption** -A lot of EWTI staff who received technical transfer from the Project do not leave EWTI -Institutional structure of EWTI is not drastically changed due to political effects	**Important Assumption** -A lot of EWTI staff who received technical transfer from the Project do not leave EWTI -Institutional structure of EWTI is not drastically changed due to political effects	No change

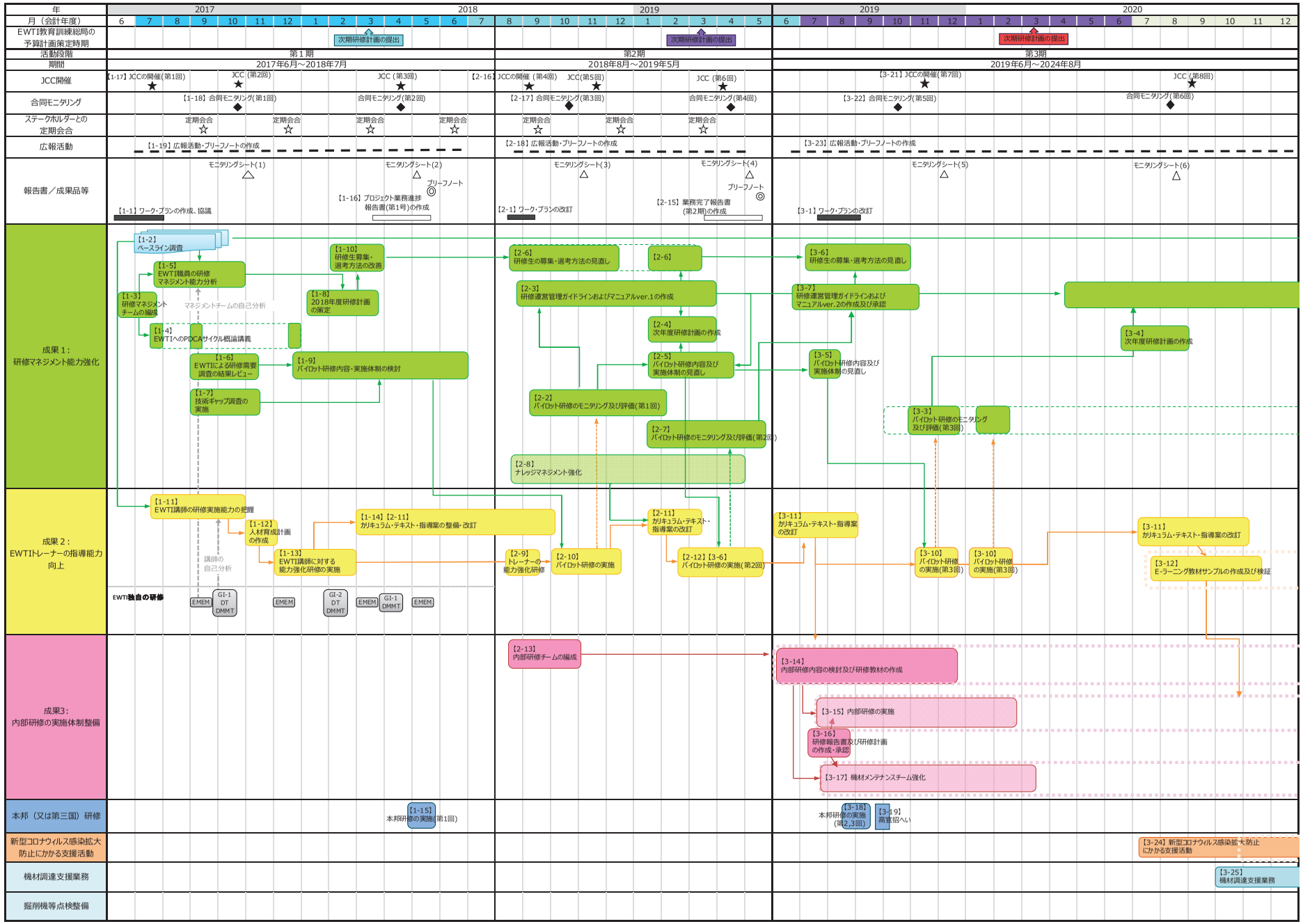
No.	Ver.4	Ver.5.1	Reasons for Amendment from Ver.4 to Ver.5.1
14	**Output 1** Training management structure of EWTI is strengthened through PDCA cycle	**Output 1** Training management structure of EWTI is strengthened through PDCA cycle	No change
15	**Objectively Verifiable Indicators for Output 1** 1-1. Training needs, training evaluation results are reflected to the following annual training plan. 1-2. The results of pilot training are reflected to guidelines-on training operation and management. 1-3. An international training course is operated and managed by Water Technology Education and Training Directorate more than once.	**Objectively Verifiable Indicators for Output 1** 1-1. Training needs, training evaluation results are reflected to the following annual training plan. 1-2. The results of pilot training are reflected to guidelines-on training operation and management. 1-3. An international training course is operated and managed by Water Technology Education and Training Directorate (WTETD) more than once.	Added abbreviation.
16	**Means of Verification** -Annual training plan -The guidelines on training operation and management version 3	**Means of Verification** -Annual training plan -The guidelines on training operation and management version 3	No change
17	**Output 2** Training capacity of EWTI's trainers is enhanced through pilot training courses	**Output 2** Training capacity of EWTI's trainers is enhanced through pilot training courses	No change
18	**Objectively Verifiable Indicators for Output 2** 2-1. Learning module and training, teaching and learning materials developed by trainers are officially approved. 2-2. Trainers apply the practical knowledge (technical skills and pedagogical skills) gained from the capacity development training in the pilot training. 2-3. More than 70% of trainees achieve the learning outcome set in a learning module at the end of the training course in the Pilot Training courses, including the international	**Objectively Verifiable Indicators for Output 2** 2-1. Learning module and training, teaching and learning materials developed by trainers are officially approved. 2-2. Trainers apply the practical knowledge (technical skills and pedagogical skills) gained from the capacity development training in the pilot training. 2-3. More than 70% of trainees achieve the learning outcome set in a learning module at the end of the training course in the Pilot Training courses, including the international	No change
19	**Means of Verification** - Learning module and training, teaching and learning materials -TTLM E-learning version samples -Action plan for preparation of e-learning -Project reports -EWTI's annual report	**Means of Verification** - Learning module and training, teaching and learning materials -TTLM E-learning version samples -Hybrid training design documents -Action plan for preparation of e-learning -Project reports -EWTI's annual report	It was found that the E-learning sample of TTLM has not been well utilized, as EWTI resumed regular group training. However, EWTI has an intention to prepare the alternative mode of training delivery in responding to the diverse needs in the country. A hybrid training will be introduced as an alternative.

No.	Ver.4	Ver.5.1	Reasons for Amendment from Ver.4 to Ver.5.1
20	**Output 3** Implementation structure of internal training for EWTI's trainers is established	**Output 3** Implementation structure of internal training for EWTI's trainers is established	No change
21	**Objectively Verifiable Indicators for Output 3** 3-1. Internal training materials and internal training plans are periodically prepared and approved. 3-2. Terms of Reference for the Maintenance Team is approved 3-3. More than 80% of participants who attend the internal training courses achieve the learning outcome set in each internal training course.	**Objectively Verifiable Indicators for Output 3** 3-1. Internal training materials and internal training plans are periodically prepared and approved. 3-2. More than 80% of participants who attend the internal training courses achieve the learning outcome set in each internal training course. 3-3. Training materials for four technical areas (GWDM, DT, DMMT and EMMT) are kept in place. 3-4 Terms of Reference for the Maintenance Team is approved by Director General. 3-5 Regular maintenance activities by the Maintenance Team are conducted for more than 6 months based on the TOR for the Maintenance Team.	3-2 was changed to 3-4. 3-3 is added, as EWTI needs to emphasize more on the maintenance of training materials in an organized manner. A database should be created and training materials (e.g. TTLMs) should be kept in order, so that they will be retrieved, utilized and updated, whenever necessary. 3-5 is added to specify the activities of Maintenance Team and to strengthen their capacity.
22	**Means of Verification** -Internal training materials -Internal training plan -Project report -EWTI's annual report -Results of questionnaire survey for participants -TOR for Maintenance Team	**Means of Verification** -Internal training materials -Internal training plan -Project report -EWTI's annual report -Results of questionnaire survey for participants -Training Completion Reports -TOR for Maintenance Team -Maintenance check sheets -Machinery/equipment maintnane annual plan -Procurement plan	Training Completion Reports are added to verify the implementation of internal training as planned. Maintenance check sheets are added to verify the implementation of regular maintenance activities by Maintenance Team. Machinery/equipment maintenance annual plan and procurement plan are added to verify the functionality of the Maintenance Team and the linkage between the Maintenance Team and finance through the advise by the EWTI management.
23	**Important Assumption for Outputs** -Natural disaster (earthquake, flooding, etc.) causing drastic damages will not occur. -Security and economic situation in Ethiopia are not drastically worsened than the present situation.	**Important Assumption for Outputs** -Natural disaster (earthquake, flooding, etc.) causing drastic damages will not occur. -Security and economic situation in Ethiopia are not drastically worsened than the present situation.	No change
24	**Activity 1-1** EWTI establishes the Training Management Committee	**Activity 1-1** EWTI establishes the Training Management Committee	No change
25	**Activity 1-2** The JICA Experts conducts training courses on introduction of the PDCA concept	**Activity 1-2** The JICA Experts conducts training courses on introduction of the PDCA concept	No change
26	**Activity 1-3** The JICA Experts and the Training Management Committee grasp current training management challenges of EWTI through base-line survey	**Activity 1-3** The JICA Experts and the Training Management Committee grasp current training management challenges of EWTI through base-line survey	No change
27	**Activity 1-4** The Training Management Committee reviews training demand survey conducted by EWTI	**Activity 1-4** The Training Management Committee reviews training demand survey conducted by EWTI	No change
28	**Activity 1-5** The Training Management Committee and EWTI's trainers conduct technical-gap finding survey and analyze the result	**Activity 1-5** The Training Management Committee and EWTI's trainers conduct technical-gap finding survey and analyze the result	No change
29	**Activity 1-6** The Training Management Committee formulates annual training plan for the following year based on the results in Activity 1-4 and 1-5	**Activity 1-6** The Training Management Committee formulates annual training plan for the following year based on the results in Activity 1-4 and 1-5	No change

No.	Ver.4	Ver.5.1	Reasons for Amendment from Ver.4 to Ver.5.1
30	**Activity 1-7** The Training Management Committee and EWTI's trainers formulate pilot training courses / international courses scope and implementation structure based on Activity 1-5 and 1-6	**Activity 1-7** The Training Management Committee and EWTI's trainers formulate pilot training courses / international courses scope and implementation structure based on Activity 1-5 and 1-6	No change
31	**Activity 1-8** The Training Management Committee reviews the current recruit and selection methods	**Activity 1-8** The Training Management Committee reviews the current recruit and selection methods	No change
32	**Activity 1-9** The Training Management Committee recruits and selects trainees with improved methods through Activity 1-8	**Activity 1-9** The Training Management Committee recruits and selects trainees with improved methods through Activity 1-8	No change
33	**Activity 1-10** The Training Management Committee monitors and evaluates pilot training courses / international courses implemented through Output 2, and reviews the training scope and implementation structure	**Activity 1-10** The Training Management Committee monitors and evaluates pilot training courses / international courses implemented through Output 2, and reviews the training scope and implementation structure	No change
34	**Activity 1-11** The Training Management Committee formulates the guidelines on training operation and management version 1	**Activity 1-11** The Training Management Committee formulates the guidelines on training operation and management version 1	No change
35	**Activity 1-12** The Training Management Committee and EWTI's trainers repeat activities described from Activity 1-6 to 1-10 twice	**Activity 1-12** The Training Management Committee and EWTI's trainers repeat activities described from Activity 1-6 to 1-10 twice	No change
36	**Activity 1-13** The Training Management Committee revises the guidelines on training operation and management to version 3 based on the result of Activity 1-12	**Activity 1-13** The Training Management Committee revises the guidelines on training operation and management to version 3 based on the result of Activity 1-12	No change
37	**Activity 1-14** The Training Management Committee shares the guidelines on training operation and management version 3 for training with EWTI	**Activity 1-14** The Training Management Committee shares the guidelines on training operation and management version 3 for training with EWTI	No change
38	**Activity 2-1** The JICA Expert Team and EWTI's trainers grasp the challenges of EWTI 's trainers regarding training implementation through the baseline survey	**Activity 2-1** The JICA Expert Team and EWTI's trainers grasp the challenges of EWTI 's trainers regarding training implementation through the baseline survey	No change
39	**Activity 2-2** The JICA Expert Team and EWTI's trainers formulate capacity development plans and clarify the goal of capacity development	**Activity 2-2** The JICA Expert Team and EWTI's trainers formulate capacity development plans and clarify the goal of capacity development	No change
40	**Activity 2-3** The JICA Expert Team gives lessons on strengthening instructional design to EWTI's trainers based on the challenges identified in Activity 2-1	**Activity 2-3** The JICA Expert Team gives lessons on strengthening instructional design to EWTI's trainers based on the challenges identified in Activity 2-1	No change
41	**Activity 2-4** The JICA Expert Team gives lessons for curriculum formulation based on the challenges identified in Activity 2-1	**Activity 2-4** The JICA Expert Team gives lessons for curriculum formulation based on the challenges identified in Activity 2-1	No change
42	**Activity 2-5** The JICA Expert Team gives lessons for upgrading technical skills to EWTI's trainers based on the challenges identified in Activity 2-1	**Activity 2-5** The JICA Expert Team gives lessons for upgrading technical skills to EWTI's trainers based on the challenges identified in Activity 2-1	No change
43	**Activity 2-6** EWTI's trainers formulate learning module and training, teaching and learning materials based on the TTLM manual for pilot training / international courses	**Activity 2-6** EWTI's trainers formulate learning module and training, teaching and learning materials based on the TTLM manual for pilot training / international courses	No change

No.	Ver.4	Ver.5.1	Reasons for Amendment from Ver.4 to Ver.5.1
44	**Activity 2-7** EWTI's trainers implement the pilot training courses / international courses	**Activity 2-7** EWTI's trainers implement the pilot training courses / international courses	No change
45	**Activity 2-8** EWTI's trainers review and improve pilot training contents (learning module and training, teaching and learning materials) based on the results of Activity 1-10	**Activity 2-8** EWTI's trainers review and improve pilot training contents (learning module and training, teaching and learning materials) based on the results of Activity 1-10	No change
46	**Activity 2-9** EWTI's trainers repeat Activities 2-6 to 2-8	**Activity 2-9** EWTI's trainers repeat Activities 2-6 to 2-8	No change
47	**Activity 2-10** EWTI's trainers experience the sample of the TTLM for e-learning and make an action plan for preparation of e-learning at EWTI.	**Activity 2-10** EWTI's trainers experience the sample of the TTLM for e-learning and make an action plan for preparation of e-learning at EWTI.	No change
48	**Activity 2-11** EWTI's trainers produce necessary video contents as a part of preparatory activities for e-learning provision.	**Activity 2-11** EWTI's trainers produce necessary video contents as a part of preparatory activities for e-learning provision.	No change
49		**Activity 2-12** EWTI establishes a platform for E-learning on a Learning Management System (LMS).	Newly added to specify the activities related to E-learning
50		**Activity 2-13** EWTI's trainer deliver the training utilizing the platform established through the activity 2-12 above at least in one technical training course.	Newly added to specify the activities related to E-learning
51	**Activity 3-1** EWTI establishes Internal Training Team to transfer the knowledge acquired through Output 2 activities to other trainers	**Activity 3-1** EWTI establishes Internal Training Team to transfer the knowledge acquired through Output 2 activities to other trainers	No change
52	**Activity 3-2** Internal Training Team decides the contents of internal training for other trainers	**Activity 3-2** Internal Training Team decides the contents of internal training for other trainers	No change
53	**Activity 3-3** Internal Training Team formulates training materials based on the result of Activity 3-2	**Activity 3-3** Internal Training Team formulates training materials based on the result of Activity 3-2	No change
54	**Activity 3-4** Trainers, who got capacity development through the Project, implement internal training courses to other trainers	**Activity 3-4** Trainers, who got capacity development through the Project, implement internal training courses to other trainers	No change
55	**Activity 3-5** Internal Training Team formulates the internal training report to Director General	**Activity 3-5** Internal Training Team formulates the internal training report to Director General	No change
56	**Activity 3-6** Internal Training Team formulates internal training plan for the following year	**Activity 3-6** Internal Training Team formulates internal training plan for the following year	No change
57	**Activity 3-7**	**Activity 3-7** EWTI assigns appropriate section to be in charge of knowledge management.	Newly added to specify the activities of knowledge management.
58	**Activity 3-8**	**Activity 3-8** The authorized section in the Activity 3-7 systematically maintains the training resources in database.	Newly added to specify the activities of knowledge management.
59	**Activity 3-8**	**Activity 3-9** The Maintenance Team regularly checks the function of the machinery/equipment for training and submits the report to the relevant authority	Newly added to specify the activities by Maintenance Team.
60	**Activity 3-8**	**Activity 3-10** EWTI management staff critically reviews the report prepared by the Maintenance Team and takes necessary actions.	Newly added to specify the activities bu Maintenance Team.

No.	Ver.4	Ver.5.1	Reasons for Amendment from Ver.4 to Ver.5.1
	Inputs	**Inputs**	
	The Japanese Side	**The Japanese Side**	
61	1. Experts - Chief Advisor / Training Management 1 - Deputy Chief Advisor / Training Management 2 - Curriculum and Training Material Development 1&2 - Groundwater Development / Hydrogeology 1&2 - Drilling Technology - Drilling Machinery Maintenance Technology 1&2 - Electro-mechanical Machinery Maintenance Technology - Project Coordinator - Training Material Development 1&2 2. Training - Training in Japan and third countries (including training cost) 3. Third-country Training (acceptance of trainees from outside Ethiopia) 4 Local cost - Transportation cost for Japanese Expert Team - Expense for workshop and Joint Coordination Committee (JCC)	1. Experts - Chief Advisor / Training Management 1 - Deputy Chief Advisor / Training Management 2 - Curriculum and Training Material Development 1&2 - Groundwater Development / Hydrogeology 1&2 - Drilling Technology 1&2 - Drilling Machinery Maintenance Technology 1&2 - Electro-mechanical Machinery Maintenance Technology 1&2 - Training Material Development 1&2&3 - Business Management - E-learning - Project Coordinator 2. Training - Training in Japan and third countries (including training cost) 3. Third-country Training (acceptance of trainees from outside Ethiopia) 4 Local cost - Transportation cost for Japanese Expert Team - Expense for workshop and Joint Coordination Committee (JCC) 5. Machinery / materials - Drilling related equipment - Materials for a deep well drilling - Laptop PC	Input of Japanese Experts were added according to the newly added activities.


年
月（会計年度）
EWTI教育訓練総局の予算計画策定時期
次期研修計画の提出
活動段階
第１期
第2期
第3期
期間
2017年6月～2018年7月
2018年8月～2019年5月
2019年6月～2024年8月
JCC開催
【1-17】JCCの開催(第1回)
JCC (第2回)
JCC (第3回)
【2-16】JCCの開催 (第4回)
JCC(第5回)
JCC (第6回)
【3-21】JCCの開催(第7回)
JCC (第8回)
合同モニタリング
【1-18】合同モニタリング(第1回)
合同モニタリング(第2回)
【2-17】合同モニタリング(第3回)
合同モニタリング(第4回)
【3-22】合同モニタリング(第5回)
合同モニタリング(第6回)
ステークホルダーとの定期会合
定期会合
広報活動
【1-19】広報活動・ブリーフノートの作成
【2-18】広報活動・ブリーフノートの作成
【3-23】広報活動・ブリーフノートの作成
報告書／成果品等
モニタリングシート(1)
モニタリングシート(2)
ブリーフノート
【1-16】プロジェクト業務進捗報告書(第1号)の作成
【1-1】ワーク・プランの作成、協議
モニタリングシート(3)
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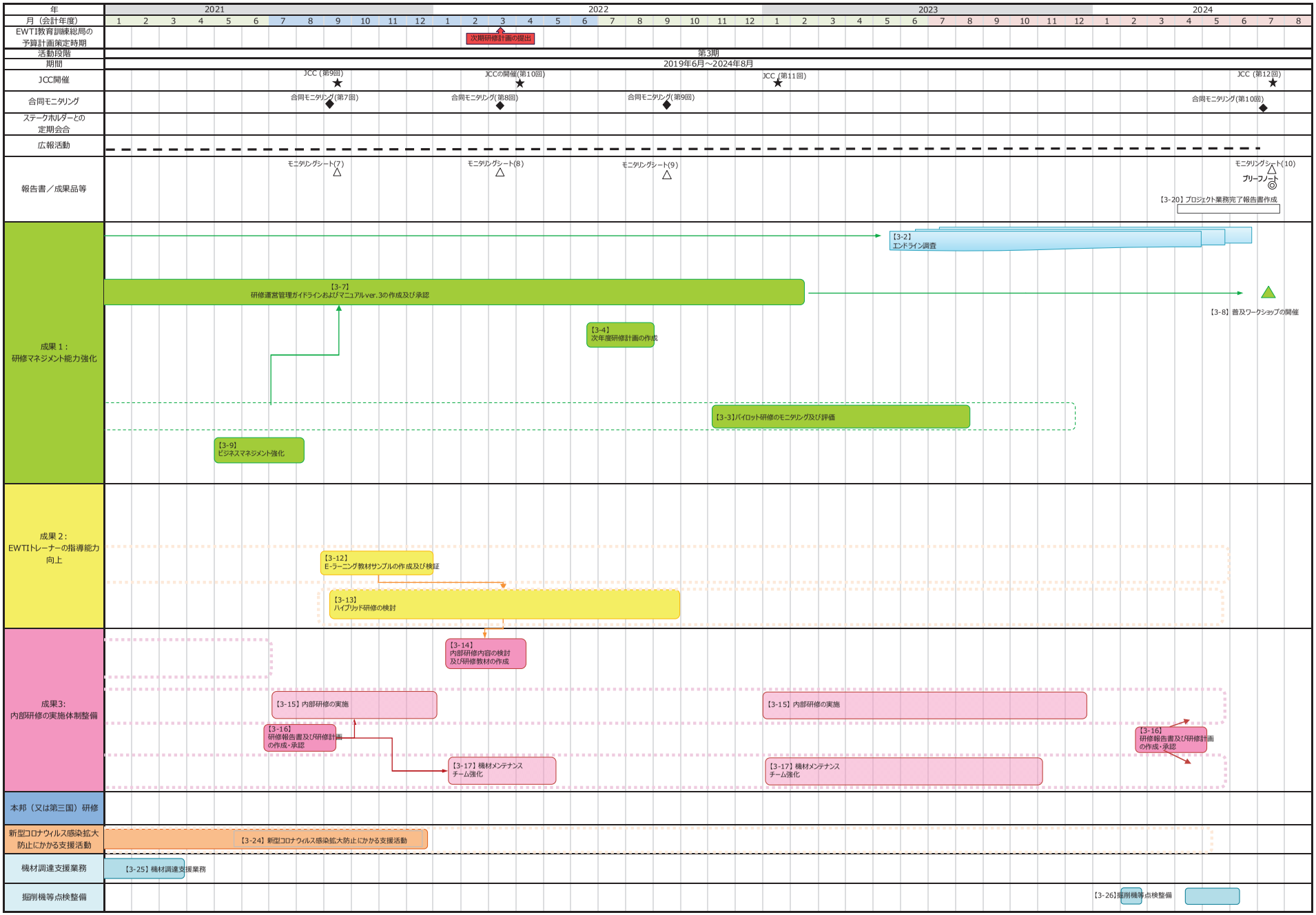
年
2021
2022
2023
2024
月（会計年度）
EWTI教育訓練総局の予算計画策定時期
次期研修計画の提出
活動段階
第3期
期間
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JCC (第9回)
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添付資料4

PDM Ver.5.1 に基づく活動進捗概要（2024 年 7 月現在）

No.	Activity	Achievement as of Sep '22	Achievement as of Jul '24
1-1	EWTI establishes the Training Management Committee	- Training Management Team was established at the 1st JCC Meeting. - Training Management Team was transformed into Training Management Committee (TMC) - Sub-committees for Course Design and Learning Module, and Annual Training Plan Review were added to the Guidelines in March '22. - -Latest TTLMs were submitted to TMC for its review and approval	- TMC function is yet to be strengthened. - The TTLMs for Fluid Engineering and Gen-set O&M ver.3 were approved in Dec. '22, printed and distributed by July '24. - Activity completed
1-2	The JICA Experts conduct training courses on introduction of the PDCA concept	- PDCA Workshop 1 was conducted in Jul. '17. - Findings from the 1st and 2nd Pilot Training were reflected to the TTLMs and Guidelines. - PDCA cycle is reminded at various occasions, such as Training Management Committee meetings and workshops.	Completed by Sep '22
1-3	The JICA Experts and the Training Management Committee grasp current training management challenges of EWTI through baseline survey	- Baseline information report was compiled.	Completed by Sep '22
1-4	The Training Management Committee reviews training demand survey conducted by EWTI	- Training Needs Assessment Survey was reviewed and the findings were shared among TMT and trainers. The review results of TNA were reflected to the design of Technical Gap Survey.	Completed by Sep '22
1-5	The Training Management Committee and EWTI's trainers conduct technical-gap finding survey and analyse the result	- TGS report was compiled and the results were shared among trainers and management staff. The results were reflected to the selection of Pilot Training topic.	Completed by Sep '22
1-6	The Training Management Committee formulates annual training plan for the following year based on the results in Activity 1-4 and 1-5	- Pilot training was planned as a part of annual training plan of 2018/19 and 2019/20 fiscal years. - A consensus was built the training schedule should not be changed after announcement. - Annual training plan for 2020/2	Completed Internal training plans yet to be integrated to annual training plan.

No.	Activity	Achievement as of Sep '22	Achievement as of Jul '24
		and 21/22 have been changed several times, due to the impact of COVID-19, and acceptance of a number of on-demand training courses. - Annual training plan for 2022/23 was prepared.	
1-7	The Training Management Committee and EWTI's trainers formulate pilot training courses / international courses scope and implementation structure based on Activity 1-5 and 1-6	- Targets and contents of pilot training courses were selected, based on the activities 1-4/1-5/1-6. - Training modules and implementation structure were formulated for the 1st – 3rd Training courses.	Completed by Sep '22
1-8	The Training Management Committee reviews the current recruit and selection methods	- Improved methods and procedures were tested at the 1st to 3rd Pilot Training and lessons were drawn. - Lessons were incorporated to the Guidelines ver.3 (draft).	Completed by Sep '22
1-9	The Training Management Committee recruits and selects trainees with improved methods through Activity 1-8	- Some improved methods of recruitment were attempted for the 1st to 3rd Pilot Training. Lessons were compiled for improvement. - Recruitment of the trainees outside country were conducted with a proper recruitment method.	- Implementation of the Guidelines is being monitored - Activity completed
1-10	The Training Management Committee monitors and evaluates pilot training courses / international courses implemented through Output 2, and reviews the training scope and implementation structure	- The process of the training sessions was recorded, while trainers conducted daily/weekly reflection, End of Course Review Meetings to monitor the training. during 1st- 3rd Pilot Training. - The importance of monitoring was thoroughly discussed in the course of guidelines revision. - Monitoring results were incorporated in the Guidelines and TTLMs.	Completed by Sep '22
1-11	The Training Management Committee formulates the guidelines on training operation and management version 1	- The Guidelines for Training Operation and Management version 1 was tested during the 2nd Pilot Training.	Completed by Sep '22
1-12	The Training Management Committee and EWTI's trainers repeat activities described from Activity 1-6 to 1-10 twice	- Activities repeated three times.	Completed by Sep '22

No.	Activity	Achievement as of Sep '22	Achievement as of Jul '24
1-13	The Training Management Committee revises the guidelines on training operation and management to version 2 based on the result of Activity 1-12	- The guidelines version 2 was drafted and tested during the 3rd Pilot Training.	Completed by Sep '22
1-14	The Training Management Committee shares the guidelines on training operation and management version 3 with EWTI	- The Guidelines ver.3 was approved by TMC and to be finalized after the organization restructure	The Guidelines ver.3 was printed and distributed in the Dissemination Workshop in Jul. '24. Completed
2-1	The JICA Expert Team and EWTI's trainers grasp the challenges of EWTI 's trainers regarding training implementation through the baseline survey.	- Self-assessment of instructional designing capacity was conducted in Jul. 2017 and July 2019. - Technical competency assessment was done through capacity building training of trainers.	Completed by Sep '22
2-2	The JICA Expert Team and EWTI's trainers formulate capacity development plans and clarify the goal of capacity development	- Capacity development plan was prepared. - Detailed targets of capacity development was developed.	Completed by Sep '22
2-3	The JICA Expert Team gives lessons on strengthening instructional design to EWTI's trainers based on the challenges identified in Activity 2-1	- 4 times of Instructional Design Workshops were conducted. - Improved ways of instruction were introduced based on the results of the Pilot Training observation by the JICA Expert Team. - Lessons learned from Pilot Training are reflected to the TTLM version 3 with incorporation of instructional design concepts.	Completed by Sep '22
2-4	The JICA Expert Team gives lessons for curriculum formulation based on the challenges identified in Activity 2-1	- Trainers learned basic concept and methods of training design through Instructional Design Workshops.	Completed by Sep '22
2-5	The JICA Expert Team gives lessons for upgrading technical skills to EWTI's trainers based on the challenges identified in Activity 2-1	- Capacity development training for trainers was conducted on water quality analysis, water balance analysis, pumping test analysis, GIS, well design, geophysical logging and geologic columnar section, generator maintenance, drilling fluid engineering and compressor maintenance. - Capacity development training	Completed

No.	Activity	Achievement as of Sep '22	Achievement as of Jul '24
		for trainers is being conducted as internal training.	
2-6	EWTI's trainers formulate learning module and training, teaching, and learning materials based on the TTLM manual for pilot training / international courses	- Trainers formulated the learning modules and TTLMs version 1, 2 and 3 and tested during the 1st, 2nd and 3rd Pilot Training. - Sample of online version of TTLM was developed and tested by the selected trainers. - Video clips to supplement TTLM have been prepared.	- TTLM Revision Workshop is to be routine activity of EWTI. - Activity completed
2-7	EWTI's trainers implement the pilot training courses / international courses	- The 1st Pilot Training Courses were implemented on Gen-set O&M*, Air Compressor O&M, Drilling Supervision and Drilling Fluid Engineering. - The 2nd Pilot Training Courses were implemented on Gen-set O&M, Drilling supervision and Fluid drilling - The 3rd Pilot Training Courses (international courses) on Drilling Fluid Engineering and Gen-set O&M were conducted.	Completed by Sep '22
2-8	EWTI's trainers review and improve pilot training contents (learning module and training, teaching, and learning materials) based on the results of Activity 1-10	- EWTI trainers reviewed and improved the contents of Pilot Training, reflecting the results of the monitoring of Pilot Training 1, 2 and 3. - Learning Module and TTLM version 3 were prepared. - The latest versions were submitted to TMC for official approval.	- TTLM for Fluid Engineering and Gen-set O&M were approved by TMC in Dec. '22. - Activity completed
2-9	EWTI's trainers repeat Activity 2-6 to 2-8	- The activities were repeated three times.	Completed by Sep '22
2-10	EWTI's trainers experience the sample of the TTLM for e-learning and make an action plan for preparation of e-learning at EWTI.	- TTLM e-learning sample was prepared and a team of EWTI staff experienced it. - E-learning material: TTLM for TTLM was developed and the trainers experienced a hybrid training utilizing the e-learning platform (Moodle). - Trainers have experienced the sample of TTLM for e-learning.	- Action plan was prepared - Activity completed
2-11	EWTI's trainers produce necessary video contents as a part of preparatory activities for e-learning provision.	- Video clips to supplement TTLMs were being developed for GIS and Remote Sensing, Water Supply Engineering, Non-revenue Water and Gen-set O&M. - Video clips were prepared for	Completed

No.	Activity	Achievement as of Sep '22	Achievement as of Jul '24
		Gend-set O&M and Non-revenue Water.	
2-12	EWTI establishes a platform for E-learning on a Learning Management System (LMS).	- Trainers were trained on the establishment of the e-learning platform (Google Classroom)	Activity completed
2-13	EWTI's trainers deliver the training utilizing the platform established through the activity 2-12 above at least in one technical training course.	- Trainers created the platform to deliver the e-learning with sample TTLMs (EMMT, NRW).	- Pre/post tests were presented online with one training course - E-learning materials were presented to EWTI management - Activity completed
3-1	EWTI establishes Internal Training Team to transfer the knowledge acquired through Output 2 activities to other trainers	- Internal Training Team / Knowledge Management Task Force was established - Facilitators for the internal training performed internal training. - Internal Training Team /KM Committee was being restructured in Jan. '22.	Completed.
3-2	Internal Training Team decides the contents of internal training for other trainers	- The contents of TTLM Revision Workshop as an internal training has been well established as a routine internal training of EWTI.	Completed
3-3	Internal Training Team formulates training materials based on the result of Activity 3-2	- TTLM for TTLM development was developed and revised, being used for internal training. - TTLM for TTLM has been prepared and uploaded to the e-learning system for hybrid training	Completed
3-4	Trainers, who got capacity development through the Project, implement internal training courses to other trainers	- 3 trainers who got capacity development facilitated the 1st internal training (TTLM) - 4 trainers who got capacity development through the 1st internal training facilitated the 2nd internal training (TTLM) - 4 trainers/experts facilitated the TTLM Revision Workshop (hybrid training) in Sep. '21, April and Aug. '22.	- Internal training on drilling and drilling machinery maintenance were conducted. - EWTI continues TTLM Revision Workshop as its routine activity. - Activity completed
3-5	Internal Training Team formulates the internal training report to Director General	- Completion Reports were produced by the facilitators of the four internal training (TTLM)	Completed
3-6	Internal Training Team formulates internal training plan for the following year	- Facilitators of TTLM Revision Workshop became able to plan their training plans.	- Annual plan of internal training has not been prepared but annual TTLM revision became a routine.

No.	Activity	Achievement as of Sep '22	Achievement as of Jul '24
3-7	EWTI assigns appropriate section to be in charge of knowledge management.	- EWTI DG assigned the KM task force members.	- KM/ internal training task force is not active as a team but individuals are functioning
3-8	The authorized section in the Activity 3-7 systematically maintains the training resources in database.	- Training materials, guidelines with formats are kept in EWTI's portal site.	Completed
3-9	The Maintenance Team regularly checks the function of the machinery/equipment for training and submits the report to the relevant authority.	- The Maintenance Team inspects the machinery/ equipment in an ad hoc basis. Need more attention by the management. - No inspection report since Nov '22	Regular inspection is discontinued since Nov. '22, but necessary maintenance work is continued.
3-10	EWTI management staff critically reviews the report prepared by the Maintenance Team and takes necessary actions.	- EWTI management checked the inspection sheets but discontinued - Spare parts procurement process was not successful.	Monitoring by management is yet to be strengthened.

Project for Strengthening Capacity for Training Operation and Management for Ethiopian Water Technology Institute (EWTI)

Organizational Baseline Information

(Draft)

February 2018

Table of Contents

Annex

Acronyms

Acronym	Description
BPR	Business Process Re-engineering
BSC	Balance Scorecard
COC	Certificate of Competency
C/P	Counterpart
DMMT	Drilling Machinery Maintenance Technology
DT	Drilling Technology
EM/DMMT	Electro-Mechanical and Drilling Machinery Maintenance Technology
EMI	Ethiopian Management Institute
EMMT	Electromechanical Machinery Maintenance Technology
ETTL	Education and Training Team Leader
EWTEC	Ethiopian Water Technology Centre
EWTI	Ethiopian Water Technology Institute
GI	Groundwater Investigation
GIS	Geographic Information System
GTP	Growth and Transformation Plan
HRM	Human Resource Management
ID	Instructional Design
JICA	Japan International Cooperation Agency
MoPS&HRD	Ministry of Public Service and Human Resources Development
MoWIE	Ministry of Water, Irrigation and Electricity
NGO	Non-Governmental Organization
PDCA	Plan-Do-Check-Act
PDM	Project Design Matrix
R/D	Record of Discussions
TGS	Technical Gap Survey
TNA	Training Needs Assessment
TOT	Training of Trainers
TTLM	Training, Teaching, Learning Materials
TVET	Technical and Vocational Education and Training
TVETC	Technical and Vocational Education and Training College
WRD&DT	Water Resource Development and Drilling Technology
WSE	Water Supply Engineering
WTET	Water Technology Education and Training

Introduction

As a result of the bilateral agreement signed between the Ethiopian government and the Japanese government, a project entitled "Project for Strengthening Capacity for Training Operation and Management of EWTI" (hereinafter the Project) was initiated with the technical support by Japan International Cooperation Agency, JICA in June 2017.

As part of one of the major initial tasks of the above-mentioned Project, this Organizational Baseline Information is prepared during the period of first year of the project.

1) Objective of collecting baseline information

The objective of the baseline information is mainly to serve as a reference point in measuring any progressive change with the implementation of the various capacity building activities during the project period.

2) Methodology

The methodology applied for collecting the baseline information are the following:

- Interview
- Secondary data collection

The project team tried to get baseline information of EWTI by interviewing heads and key staff members in Water Technology Education & Training Directorate, Planning & Information Management Directorate, Human Resource Management Directorate, Corporate Communication Directorate and Registrar Office. From the above-mentioned and other directorates of EWTI, the project team collected secondary data that served as baseline information.

3) Duration of data collection

The data collection for this baseline information was carried out from July 2017 up to December 2017.

4) Baseline matrix

The baseline data collected during the survey is summarized in the following baseline matrix table. The contents of this report are based on the listed items in the table.

Table 1: Baseline matrix table

	Required information	Information source	Collection method
1	**Record of past training experiences**		
1-1	Annual training plans for the past 3 years (including all training courses)	Annual training plans, WTET Dir., Planning Dir.	Secondary data collection
1-2	Title of training courses	Training report, WTET Dir, Planning Dir.	Secondary data collection
1-3	List of participants with personal details for each course	Training report, WTET Dir., Planning Dir.	Secondary data collection
1-4	Training modules and schedule	Training report, WTET Dir., Planning Dir.	Secondary data collection
2	**Training needs analysis**		
2-1	Method and process of training needs analysis	Activity report, WTET Directorate	interview
2-2	Timing, frequency of needs analysis	Activity report, WTET Directorate	interview
2-3	Survey contents and results of needs analysis	Activity report, WTET Directorate	interview
2-4	Reflection of the survey results to the next annual training plans	Activity report, annual training plans, WTET Directorate	interview
3	**Training plans for 2017/18**		
3-1	Training plans	Training plans, WTET Directorate, Planning Directorate	Secondary data collection
3-2	Method and process of planning	WTET Directorate	Secondary data collection / interview
3-4	Guiding manuals / guidelines for planning	WTET Directorate, MoWIE	Interview
3-5	Strategic plan	BPR, BSC, other documents, WTET Directorate, Planning Directorate	Secondary data collection
3-6	Degree of understanding of the strategic plan	Workshop participants	Group interview at PDCA Workshop 1
4	**Training budget**		
4-1	Amount of budget and breakdown for the past 3 years	Budget document, financial report	Secondary data collection
4-2	Process of budget allocation (time line)	Planning Dir., WTET Dir.	Interview
4-3	Challenges in budget implementation	Planning Dir., WTET Dir.	Interview
4-4	Equipment/material procurement	Planning Dir., WTET Dir.	Interview
5	**Existing training courses and materials**		
5-1	Training contents	EWTI instructors, documents	Interview
5-2	List of training materials	EWTI instructors	Interview
5-3	Preparation and approval process	EWTI instructors	Interview
5-4	How to keep training material	EWTI instructors	Interview
5-5	Equipment	EWTI instructors	Interview
6	**Trainers**		
6-1	Number of trainers	HRM directorate	Secondary data collection
6-2	Educational background & working experience	EWTI instructors	Secondary data collection
6-3	Capacity of trainers to deliver training	EWTI instructors	self-assessment questionnaire
6-4	External trainers/lecturers	WTET Directorate & EWTI instructors	Interview
6-5	External professional partners	WTET Directorate & EWTI instructors	Interview
7	**Monitoring and evaluation system**		
7-1	Method of training evaluation	EWTI instructors, Registrar office	Interview, PDCA workshop
7-2	Frequency of evaluation	EWTI instructors, Registrar office	Interview, PDCA workshop
7-3	Way to reflect the results	EWTI instructors, Registrar office	Interview, PDCA workshop
7-4	How is the evaluation data kept	EWTI instructors, Registrar office	Interview, PDCA workshop
8	**Knowledge management**		

	Required information	Information source	Collection method
8-1	Training document management (how to keep and share)	EWTI instructors, Librarian	Interview
8-2	Information management of training evaluation	EWTI instructors, Registrar office	Interview
8-3	Library operation and management	WTET directorate, Librarian	Interview
9	**Public Relations**		
9-1	Publication of newsletter (frequency, how to make, to whom distributed)	Corporate Communication Directorate, published newsletter	Interview
9-2	Website (who manages, frequency of update, visitor's number, level of staff capacity)	Corporate Communication Directorate, existing website	Interview
9-3	Process to decide PR contents	Corporate Communication Directorate	Interview
9-4	Other information transmission (use of public mass media etc.)	Corporate Communication Directorate,	Interview
10	**Human resource development and management of EWTI**		
10-1	Job description of EWTI staff	Job description, HR Directorate	
10-2	Staff development plans (if present)	HRM Directorate, Planning document	Interview
10-3	Method and process of staff evaluation	HRM Directorate, Planning document	Interview
10-4	Frequency of staff training	HRM Directorate	Training report/record, interview
10-5	Contents and method of staff training	HRM Directorate	Training report/record, interview
10-6	Job satisfaction of staff	HRM Directorate	Interview
10-7	Perception of staff on development at EWTI	HRM Directorate	Interview / questionnaire
11	**Satisfaction of trainees**		
11-1	Degree of satisfaction of past trainees	Registrar office	Training evaluation sheet
11-2	Degree of satisfaction of past trainees' superior	WTET Directorate	Report

1 Record of past training experiences

1-1 Annual training achievement for the past 3 years (including all training courses)

Table 2: Training Conducted at EWTI from 2014/15 to 2016/17

No	Training Course Title	2014/15			2015/16			2016/17			Total		
		Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
1	Groundwater Investigation (GI)	32	3	35	33	5	38	30	5	35	95	13	108
2	Groundwater Investigation (GI: for Somali region trainees)			0			0	7	0	7	7	0	7
3	Drilling Technology (DT)	20	0	20	14	1	15	43	0	43	77	1	78
4	Drilling Machinery Maintenance Technology (DMMT)	17	1	18	12	1	13	28	0	28	57	2	59
5	Electromechanical Machinery Maintenance Technology (EMMT)	36	1	37	47	3	50	76	5	81	159	9	168
6	Irrigation & Drainage			0			0	33	3	36	33	3	36
7	Surface Water Irrigation Study & Design			0	25	4	29				25	4	
8	Water Supply Engineering (WSE)	35	6	41	38	9	47	68	11	79	141	26	167
9	Contract Administration & Project Management			0			0	44	11	55	44	11	55
10	Sanitation & Solid Waste Management			0			0	26	9	35	26	9	35
11	Well Rehabilitation			0	16	0	16	8	0	8	24	0	24
12	GIS & Remote Sensing			0			0	30	2	32	30	2	32
13	Non-Revenue Water Management			0			0	10	4	14	10	4	14
14	Water Service Management			0			0	13	2	15	13	2	15
15	Training for Meteorology Trainees			0			0	48	6	54	48	6	54
16	Post Graduate Diploma in Meteorology			0	48	6	54				48	6	
	Total	**140**	**11**	**151**	**233**	**29**	**262**	**464**	**58**	**522**	**837**	**98**	**852**
	Training for TVET Trainers												
17	Water Supply Engineering (WSE)	15	3	18			0			0	15	3	18
18	Electromechanical Machinery Maintenance Technology (EMMT)	32	18	50			0			0	32	18	50
19	EMMT, WSE and GIS & Remote Sensing			0			0	60	12	72	60	12	72
	Total	**47**	**21**	**68**	**0**	**0**	**0**	**60**	**12**	**72**	**107**	**33**	**140**
	Training for TVET Trainees												
20	EMMT and WSE (for Hawassa, Woloiso & Assosa Poly Technic College)			0			0	194	74	268	194	74	268
	Total	**0**	**0**	**0**	**0**	**0**	**0**	**194**	**74**	**268**	**194**	**74**	**268**
	Training for TVET Trainers and Trainees												
21	EMMT & WSE for TVET Trainers & Trainees			0	156	72	228			0	156	72	228
	Total	**0**	**0**	**0**	**156**	**72**	**228**	**0**	**0**	**0**	**156**	**72**	**228**
	Grand Total	**187**	**32**	**219**	**389**	**101**	**490**	**718**	**144**	**862**	**1294**	**277**	**1488**

1-2 Title of training courses

Table 3: Training courses conducted by EWTI

No	Training Course Title	Continuation from EWTEC	Newly added courses	Responsible department
1	Drilling Technology (DT)	X		WRD&DT
2	Groundwater Investigation (GI)	X		WRD&DT
3	Drilling Machinery Maintenance Technology (DMMT)	X		DEMMT
4	Electro-Mechanical Maintenance Technology (EMMT)	X		DEMMT
5	Irrigation & Drainage		X	ID
6	Surface Water Irrigation Study & Design		X	ID
7	Water Supply Engineering (WSE)	X		WSE
8	Contract Administration & Project Management		X	WSE
9	Sanitation & Solid Waste Management		X	WSE
10	Well Rehabilitation	X		WRD&DT
11	GIS & Remote Sensing	X		WRD&DT
12	Non-Revenue Water Management		X	WSE
13	Water Service Management		X	WSE

No	Training Course Title	Continuation from EWTEC	Newly added courses	Responsible department
14	Training for Meteorology Trainees		X	Directorate & Registrar
15	Post Graduate Diploma in Meteorology		X	Collaboration with Meteorology agency
16	EMMT for TVET Trainers & Trainees	X		DEMMT
17	WSE for TVET Trainers & Trainees	X		WSE

WRD&DT: Water Resource Development and Drilling Technology Department, DM/EMMT: Drilling and Electromechanical Machinery Maintenance Technology Department, WSE: Water Supply Engineering Department, ID: Irrigation and Drainage Department
Organogram is attached as Annex 1.

- Out of 16 courses, 9 courses are basically continuation from EWTEC period. Among 9 courses, GI has been divided into two phases I (focusing more on groundwater investigation) and II (focusing more on groundwater development and management) according to the characteristics of the contents. Course contents or modules are basically same as the courses conducted during EWTEC period.
- 8 courses have been added since EWTI started. Many of the newly started courses have been given by WSE department.

1-3 List of participants with personal details for each course

- All the data of training participants were collected and saved in electric data (word and excel) by Registrar Directorate.
- Institute has a constant increase in training capacity (485% in 2017/18 to compare with the number of trainees in 2014/15)
- There is no proper format to accumulate information as database. 2007 and 2008 in Excel format and 2009 in Word format. Not properly structured.

1-4 Training modules and schedule

- According to the existing trainers, the training modules presented in Table 3, which were developed during the EWTEC period, have been utilized as of now. However, it was observed that these modules were largely modified during the first round of the training courses in 2017/18.
- Training annual schedule (Table 4) is frequently changed due to many internal/external factors; unexpected absence of trainers, additional and urgent external demand for water works (e.g. urgent drilling works requested by regional government), and urgent calls for meeting/training by the government, etc.
- There are some ad-hoc demand-based trainings, according to the request of the stakeholders, with their own expenses, outside the annually planned training courses.
- Currently EWTI plans to follow the format of TVET for the preparation of curriculum and instruction material so called Training, Teaching, Learning Materials (TTLM).

Table 4: Sample of training course modules

Category		Tasks	Duration days	Theory hrs	Practice hrs	Target Organisations	Target Positions	Qualification
1. Groundwater investgation	Phase I	Module 1: Groundwater Investigation Methods	5	20	0	Regional Water Bureau Water Works Disgn and Supervision Enterprise, Water Works Construction Enterprise	Geologist, Hydrogeologist, Geophysist and Water Resources Engineer	Experiences >1 year Education > BSc Other: English ability
		Module 2: Ethiopian Geology and Hydrogeology	5	20	0			
		Module 3: Geophysics	17	20	80			
		Module 4: Geochemistry	3	12	0			
		Total	30	72	80			
	Phase II	Module 5: Drilling technology	8	24	16	Regional Water Bureau Water Works Disgn and Supervision Enterprise, Water Works Construction Enterprise	Geologist, Hydrogeologist, Geophysist and Water Resources Engineer	Experiences >1 year Education > BSc Other: English ability
		Module 6: Pumping test	6	20	8			
		Module 7: Groundwater modeling	8	20	24			
		Module 8: GIS and remote sensing	5	20	0			
		Total	27	84	48			
2. Drilling Technology		Module 1: Introduction to Geology and Hydrogeology	2.5	10	0	Water Works and Drilling Enterprise, Water Works Construciton Enterprise	Supervisor, Chief Drillers, Drillers, Mechanics, Technicians	Experience: >2 years Education: >Diploma Other: English ability
		Module 2: Drilling Administrative Techniques	1.5	6	0			
		Module 3: Units of Measurements	1.5	6	0			
		Module 4: Drilling machines and Tools	3	12	0			
		Module 5: Drilling Technology	10	40	0			
		Module 6: Function of the Drilling Machine	3	12	0			
		Module 7: Drilling Data collection and report compilation	1.5	6	0			
		Module 8: Drilling Troubleshooting	1.5	6	0			
		Module 9: Drilling Rig & tools Field Visiting	7	0	56			
		Module 10: Practical Drilling in the Field	30	0	240			
		Total	61.5	98	296			
3. Drilling Machinery Maintenance Technology		Module 1:Basicknowledge	4	11	5.5	Water Works and Drilling Enterprise, Water Works Construciton Enterprise	Mechanical Engineers, Mechanics, Chief Drillers, Technicians, Drillers	Experience: >2 years Education: >Diploma Other: English ability
		Module 2: Arc welding	2	5.5	5.5			
		Module 3: Diesel engine	6	11	22			
		Module 4: Lubrication and Lubricant	1.5	5.5	3			
		Module 5: THD rotary machines	16.5	33	58			
		Module 6: Cable tool & precaution	3	11	5.5			
		Module 7: Air compressor	4	5.5	16.5			
		Module 8: DTH Hammer	2	5.5	5.5			
		Total	39	88	121.5			
4. Electro Mechanical Technology Training		Module 1: Understand the Basic concept of Electricity	1	5.5	0	Regional Water Bureau, Zonal Water Department, Woreda Water Office, Town Water Utility	TVETC instructors, Technicians, Electrical Engineers	Experience: 0~3 years Education: Diploma Other: English ability
		Module 2: Switch board installation & maintenance	5	5.5	22			
		Module 3: Pump Technology	2	5.5	5.5			
		Module 4: Engine	1.5	5.5	3			
		Module 5: Generator	3	2.5	8			
		Module 6: Field Training	6	0	33			
		Total	18.5	24.5	71.5			

Table 5: Training courses schedule for 2017/2018 (as of Nov 2017)

No	Name of Training	No of trainee per year	Training round	Training Schedule /Number of Trainees							
				1st Quarter		2nd Quarter		3rd Quarter		4th Quarter	
				Schedule	No of trainees	Schedule	No of trainees	Schedule	No of trainees	Schedule	No of trainees
1	Ground Water Investigation (Phase 1)	30	2	-	0	Oct 23 -Dec 8	15	-	0	Apr 16-Jun1	15
2	Ground Water Investigation (Phase 2)	15	1	-	0	-	0	Feb12-March 21	15	-	0
3	GIS & Remote Sensing	53	3	Sep 25 -Oct 19	17	-	0	Jan 15-March 8	17	May 14 -June 7	19
4	Drilling Technology	30	2	-	0	Oct 23 -Dec 25	15	Mar 12-May 11	15	-	0
5	Water Well Reputation	30	2	-	0	-	0	Jan 15-Jan 30	15	May 14 -May 29	15
6	Drilling Machinery Maintenance Technology	45	3	-	0	Oct 30-Dec 18	15	Feb 12 -April 3	15	April 16 -June 4	15
7	Electro mechanical & Machinery Technology	80	4	-	0	Oct 30-Nov 22	20	Jan 15-Feb 9 &Mar 12-Apr 5	40	May 21-Jun 15	20
8	Water Supply Sewerage & Engineering Technology	60	3	Sep 25 -Oct 19	20	Dec 11-Jan2	20	Mar 12- April 5	20	-	0
9	Surface Water Irrigation Study & Design	60	4	-	0	Oct 23-Nov 14 &Dec 11 - Jan 2	30	Mar 12 -Apr 3	15	April 16 -May9	15
10	Contract Administration Project Management	80	4	-	0	Dec 11-Dec 23	20	Jan15-Feb 5 &Mar 12-Apr 3	40	May14-Jun 5	20
11	Sanitation &Solid Waste	60	3	Sep25-Oct 15	20	-	0	Jan 15 - Feb 5	20	Apr 16 -May 8	20
12	Non-Revenue Water Management	60	3	-	0	Nov 13-Dec4	20	Feb 12 -Mar 6	20	May 14-Jun 5	20
13	Sewerage Engineering Technology	60	3	-	0	Dec 11-Jan 2	20	Feb12- Mar 6	20	Apr 16 -May 8	20
14	Water Supply & sewerage Technology (TVET)	20	1	-	0	-	0	Jan 15 -Feb 10	20	-	0
15	Electro mechanical Machinery Maintenance Technology (TEVT)	20	1	-	0	-	0	Feb 12 -Mar 9	20	-	0
16	Surface Water Irrigation Study & Design(TVET)	20	1	-	0	-	0	Jan 15 - Feb 7	20	-	0
17	Contract Administration Project Management (TVET)	20	1	-	0	-	0	-	0	May 29 -Jun 11	20
18	Sanitation &Solid Waste(TVET)	20	1	-	0	-	0	-	0	May 14 -Jun 5	20
19	Electro mechanical Machinery Maintenance Technology (TVET)	150	2	-	0	Dec 11-Dec 27	75	-	0	Apr 16 -May 16	75
20	Water Supply Sewerage Engineering Technology (TVET)	80	2	-	0	Dec 18 -Jan 4	40	-	0	Apr 30 - May 11	40
21	Contract Administration Project Management (TVET)	70	2	-	0	Dec 18 -Jan 4	35	-	0	Apr 15 -May 6	35

2 Training needs analysis

2-1 Method and process of training needs analysis

- Training Needs Assessment (TNA) was planned and conducted by EWTI staff in 2016 and EWTI prepared a TNA report.
- Procedure

1. Agenda of TNA is requested from either WTET Directorate or Director General
2. The decision is made in a management meeting
3. TOR preparation
4. Financial and logistic plan is prepared by WTET Directorate
5. Approval by Director General
6. Preparation of questionnaires
7. Implementation of field work
8. Analysis and report writing
9. Presentation to EWTI staff

2-2 Timing, frequency of needs analysis

- Frequency: Every 5 years when GTP is revised.
- Timing: Not fixed but preferred time is in rainy season (June to August).

2-3 Survey contents and results of needs analysis

- Structured questionnaires were used during the field survey. The same questionnaire as the one which was used during EWTEC period (2009) was used but not all the questionnaires were used (only the questionnaires which ask importance of the existing courses and additional modules).
- EWTI staff has ability to plan the TNA but the survey tools, selection of targets and analysis need to be improved.

2-4 Reflection of the survey results to the next annual training plans

- There is intention but no actual plan to reflect the results of the TNA into the next training plan.

3 Training plans and selection of trainees

3-1 Training plans

- The planned number of trainees is presented in Table 5.
- EWTI has a 5 year strategic plan (2015/16-2019/20) which serves as a reference to draw the yearly training plan of EWTI. The yearly number of training courses and number of target trainees are stated in the plan for different courses. Based on this plan, EWTI prepares a yearly plan and schedule.
- This strategic plan is revised every year and the number of training courses and target trainees changes according to the budget allocated by the government.

Table 6: Targets of the 5-year Strategic Plan (2015/16-2019/20)

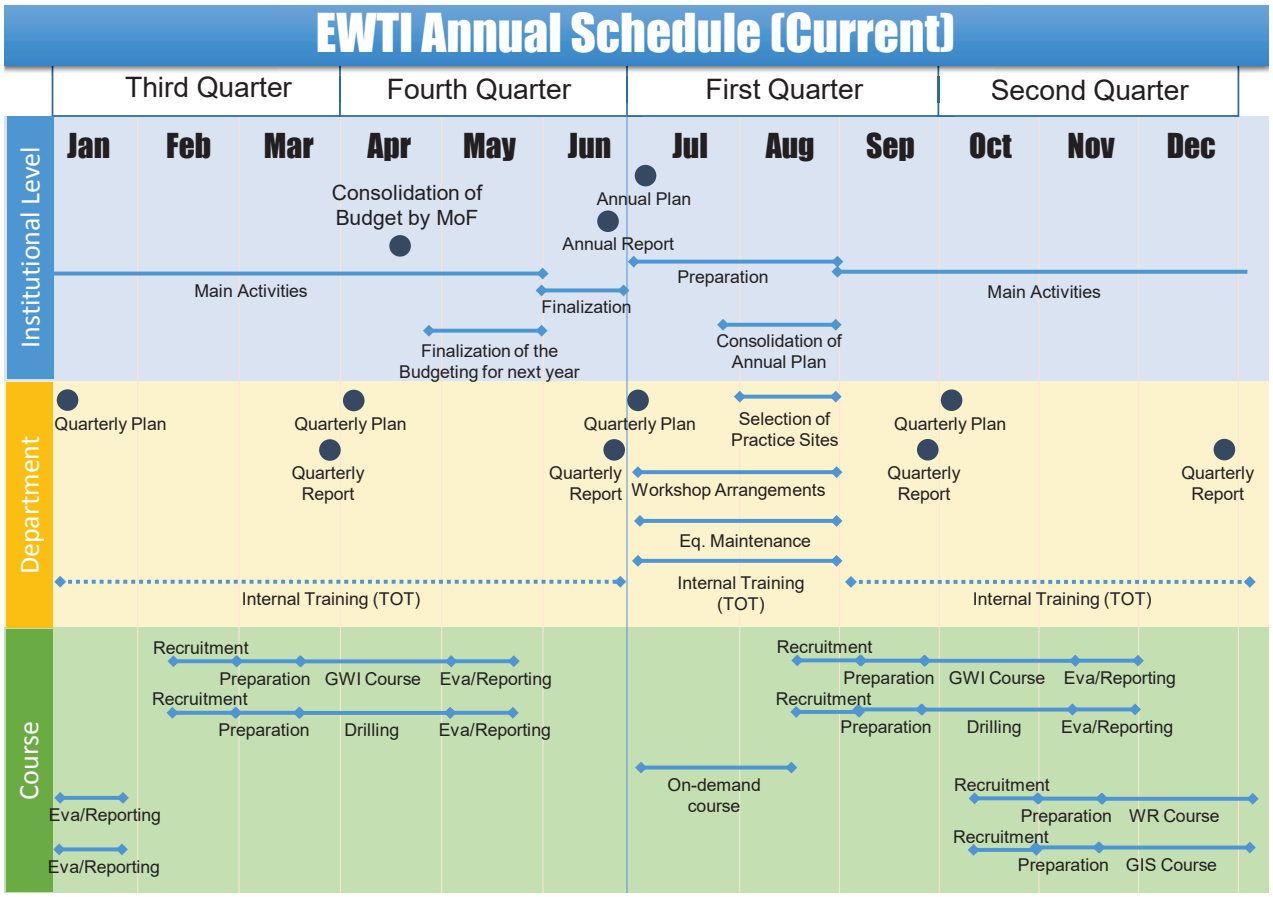
Strategic Goal	Measurements	Baseline	Targets					Total (Target)
		2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	
Goal 1. Producing 4625 trained man power to improve man power supply	No. of manpower trained in short-term training	219	490	867	869	867	907	4,000
	No. of manpower trained in long-term training	-	40	146	146	146	147	625
Goal 2. Providing professional competency assessment service for 2550 professionals to improve training quality	No. of professionals served with competency assessment	-	-	500	650	650	750	2,550
Goal 3. Transferring 5 Appropriate Technologies	No. of technology transferred	-	-	-	1	2	2	5
Goal 4. Undertaking 10 problem solving study and research	No. of conducted study and research	-	1	2	3	2	2	10
Goal 5. Building the implementation capacity of 9 water TVETC through training, technical support and consultation	No. of institutes that got the planned support	-	9	9	9	9	9	45
	Increased percentage of implementation capacity of the institutes	-	5	7	10	13	15	50
Goal 6. Providing 8 types of laboratory services by organizing specialized laboratory service and performing with quality level of 98 %	Implemented type of laboratory test in number	-	-	-	-	6	8	14
	Achieved quality level in percent	-	-	-	-	98	98	98%

3-2 Method and process of planning

- The standard process of training planning agreed during the PDCA follow-up meetings in July and August 2017 is presented in Table 7, while the experienced planning process flow is presented in Figure 1 (produced in July 2017).
- Most appropriate timing for training implementation (July–September) does not suit with the budget implementation of the country (no cash flow in this season).

Table 7: Standard process of annual planning and evaluation activities

No.	Process	Timing	Responsibility
1	Review of the training needs (previous year course evaluation, feedback)	End of June	WTET Dir, Registrar, Education Training Team Leader (ETTL)
2	Preparation of annual plan (course title, timing, duration, number of trainees/course, targets)	Beginning of July	WTET Dir, Department Heads, ETTL
3	Preparation of Mid-term plan	Beginning of January	WTET Dir, Department Heads, ETTL
4	Preparation of course program (selection of scope, general program, schedule, etc.)	End of July	Department Heads, ETTL
5	Assignment of responsible trainers	End of June	EWTI Directorate, Department Heads.
6	Follow-up survey	After 3-6 months of training	Trainers, ETTL
7	Impact survey	End of fiscal year	Trainers, ETTL
8	Quarterly report	End of quarter	WTET Dir, Department Heads
9	Annual report	End of fiscal year	WTET Dir, Department Heads



Source: Prepared during the discussion EWTI trainers work session, July 19, 2017

Figure 1: EWTI's standard annual schedule (planning and implementation of training courses)

The actual process for planning for number of training participants and training courses per year is as follows.

1. Decision of top management of EWTI for total number of trainees to be trained during the coming budget year (based on the 5 year strategic plan).
2. The director of the water technology education and training directorate along the team leaders under the directorate discusses and distribute the total number of trainees to be trained under each the team.
3. Each team allocates the total number of trainees to the training courses under the team.
4. The team will submit their draft plan to the WTET directorate and the directorate compiles the draft training plan accordingly.
5. The draft training plans along with other operation plans of EWTI are presented and discussed in the general assemble of EWTI staff.
6. After getting approval of the draft training plan from the general assembly, WTET directorate prepares the detail training plan with the implementation schedule.

3-3 Guiding manuals / Guidelines for planning

- Currently, there are no guidelines and manuals for training planning. However, the guidelines on training management are under development by EWTI as of February 2018. The process of annual training plan, presented in table 5 is subjected to change according to the contents of the guidelines.
- Due to lack of guidelines and manuals for planning the following problems have been observed.
  - Overlapping of training courses which causes shortage of accommodation.
  - Delay of notification (invitation) of training courses to respected organizations.
  - No complete training report (without evaluation).

3-4 Strategic plan

There is a strategic plan of EWTI 2015/16 to 2019/20 which is emanated from GTP II. This has components of five year major activities including training and other operations.

3-5 Degree of understanding of the strategic plan

- EWTI management staff fully participated in the drafting of the plan. General staff of EWTI are oriented the contents of the plan by the strategic plan preparation team after the first draft was completed.
- After end of each year, each department makes a review and proposes any necessary revision to the planning department. Therefore, at least management staff thoroughly understands the plan.

3-6 Selection of trainees

5) Pre-notification of annual training courses

After the planning of annual training plan by Water Technology Education and Training Directorate between every June to July, Registrar office dispatch pre-notification of EWTI's annual training schedule to concerned organizations such as MoWIE, Regional Water Bureaus, Enterprises and Private/NGO in every August. Concerned organizations reply and inform to EWTI their interested training course titles and number of participants, so that EWTI can confirm potential number of trainees for each training course. Pre-notification does not include information about required qualification of trainees such as education level and work experience.

6) Invitation to training course

One month before training commencement, Registrar office sends an invitation letter to each organization. The letter includes information on training title, date, acceptable number of participants and registration process, but does not mention about required qualification. Concerned organizations select participants for EWTI training from their staff based on their own criteria and send the information of the participants to EWTI. Registrar office confirms the participants by the document sent from the concerned organizations 7 to 15 days before the training. In the case that the expertise of the participants is different from the technical area of the planned training course, Registrar office inquires the reason to the concerned organizations and could reject in case there is no reasonable explanation.

General flow and process for trainee selection for EWTI training courses are shown in Figure 2 and Figure 3.

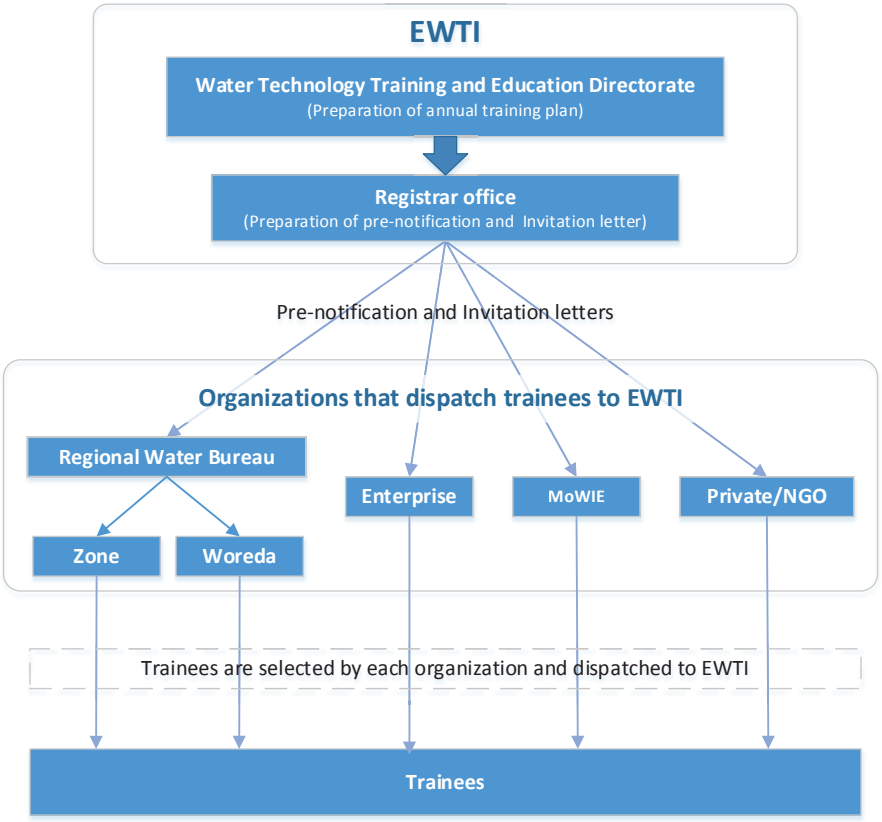


Figure 2: General flow of trainee selection for EWTI training courses

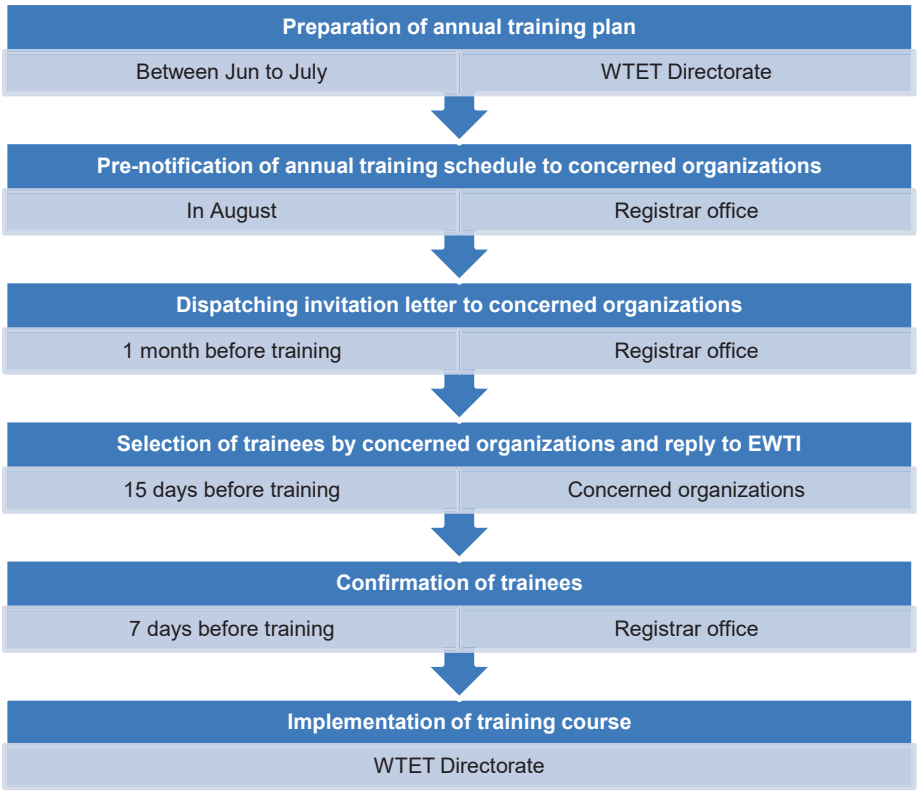


Figure 3: General process of trainee selection for EWTI training courses

4 Training budget and procurement

4-1 Amount of budget and breakdown for the past 3 years.

Allocated budget for the last three years is shown in Table 8. The budget is usually allocated with two parts: "Recurrent" and "Capital". The Recurrent budget includes the expenditure for regular operational activities or non-project costs (ex. staff salary, stationary, fuel and lubricants, facility maintenance) whereas the Capital budget refers to the budget allocated for project (ex. construction and major equipment procurement). Moreover, the budget is classified into different programs.

For instance:

"1. Management & Administration Program" budget includes all the necessary budget (Recurrent and Capital) required for each EWTI's support directorate including office of Director General (Planning, Human Resource Management, Finance & Procurement, Property & General Service and Change Management Directorates) and "2. Water Technology Training Program" budget includes all the necessary budget (Recurrent and Capital) required for operation of Water Technology Education and Training Directorate.

The budget amount of EWTI for the year 2015/2016 was relatively lower compared with the budget amount allocated for the year earlier (2014/2015). However, much more improved amount of budget was allocated (even higher than 2014/2015) for the year 2016/2017 for both recurrent and capital budgets of EWTI.

Table 8: Approved Budget for Three Fiscal Years (2014/2015, 2015/2016 & 2016/2017)

Unit: Birr

Items	2014/2015		2015/2016		2016/2017	
	Recurrent	Capital	Recurrent	Capital	Recurrent	Capital
1. Management & Administration Program	7,836,900	0	7,771,000	0	11,259,475	0
2. Water Technology Training Program	7,163,100	0	6,689,000	0	9,876,388	6,335,623
3. Laboratory Building Design Sub-Program	0	0	0	626,000	0	0
4. Laboratory Equipment Purchase Sub-Program	0	0	0	3,017,000	0	0
5. Building Construction for Class Rooms & Boarding Rooms	0	0	0	57,217,000	0	0
6. Research & Technology Transfer Program	0	0	0	0	2,993,894	0
7. TVET Support & Competency Assessment Program	0	0	0	0	1,070,079	0
8. Specialized Laboratory Service Program	0	0	0	0	1,329,600	23,664,377
Sub-total	**15,000,000**	**0**	**14,460,000**	**60,860,000**	**26,529,436**	**30,000,000**
Total	**15,000,000**		**75,320,000**		**56,529,436**	

4-2 Process of budget planning

Table 9: Process of Budget Planning

	Process	Timing (month)	Responsibility
1	Budget ceiling is notified from MoFEC to EWTI	January to February	MoFEC
2	Planning Directorate notifies to each Directorate to prepare and submit plans	Beginning of March	Planning Directorate
3	Each team prepares work plan and submit to Directorate	End of February	Each Directorate
4	Directorate compiles all plans of the teams and submits to Planning Directorate	March	Each Directorate
5	Planning Directorate compile EWTI's plan and submit to both MoWIE and MoFEC.	Middle of March	Planning Directorate
6	Budget is approved by MoFEC and notified to EWTI	Around July 7	MoFEC

4-3 Challenges in budget implementation

■ Interview to Planning Directorate and Finance Directorate

The approved budget amount is always not satisfactory to cover or to be responsive for the requested item of the budget code. Another challenge is immediate budget transfer (money from one code to another) is not possible following the release of approved budget. It is only possible after elapse of six months.

5 Existing training courses and materials

This chapter describes the baseline information of only 4 technical areas, namely, GI, DT, DMMT and EMMT.

5-1 Training contents

■ Training modules and allocated hours of lecture and practices are shown as Table 5. According to the actually implemented courses in 2017/18, the proportion of the lectures, practices and field activities is shown in table below;

Table 10: Proportion of lecture, practice and field activities for four target courses

Course	Lecture	Practice	Field
GI	53.13%	0.00%	46.88%
DT	25.00%	20.83%	54.17%
DMMT	46.11%	28.89%	25.00%
EMMT	19.44%	41.67%	38.89%

5-2 List of training materials

- No standard set of the training, teaching and learning materials. Each course has different set of materials.
- Modules and textbooks/materials are not matching one to one.
- Many documents (at least 1/3, potentially >50%) are more than 10 years old.
- There are a number of power point presentations for each course, kept with individual trainers (presentation files are under collection and compilation).
- There is an effort to re-format the training, teaching and learning materials according to the TVET standard formats (learning modules and TTLM).
- With the JICA fund, TTLM for 3 training areas, Electro-Mechanical Equipment/Machinery Maintenance (EMMM), Water Well Drilling and Construction (WWDC) and Waterworks Site Construction Management (WWSCM) was developed for EWTI based on already developed Occupational Standards aiming to use it for long term training. However, the developed TTLM is limited to Learning Guides and lacks two components, namely, the Teacher's Guide and Assessment Packet. Since EWTI has not yet started the long-term education, developed TTLM has not yet been utilized. As a subsequent step, EWTI has a plan to develop the learning modules and teaching materials using the format of TTLM for its short-term training courses. Currently, TTLM format has not yet been used in any of EWTI training courses.
- There is TTLM manual prepared by Ministry of Education in 2012.

What is TTLM?

The training, teaching and learning materials are teacher-made printed instructional aid that supplements the teacher's oral and visual instructions. It is a well-designed and carefully developed learning aid that provides detailed instructions to the trainee.

Components of TTLM

The TTLM is composed of the following three packages that serve as learning aids in meeting the learning outcomes of the training program.

- Teacher's guide
- Learning guides
- Assessment packet

Features of TTLM

- Directly related to the occupational standards and the curriculum.
- An instructional media that is individualized, self-faced instruction allowing the trainee to learn and move along independently without much or constant direction, correction and instruction from the teacher
- Designed by the teacher to fit local condition and appropriate to intended trainees
- Designed in a way that address the learning for all the learning outcomes within one learning module
- Main users of TTLM are the trainee, teacher and assessor.

(Source: TTLM development manual, Ministry of Education, March 2012)

Table 11: List of teaching/learning materials (printed materials only)

	Department	Title of the Course Material	Year of Edition	No. of page	Prepared By
1	Groundwater Investigation	Geology of Ethiopia		89	JICA Project
		Groundwater Modeling	January, 2004	47	Shiferaw Lulu
		Geophysics survey		71	
		Case study on pumping Test			JICA Project
		Geophysics Case study		93	
		Groundwater		394	
		Water well management		143	Abebe G.Hiwot, A.G Counsult
		Hydrology of Ethiopia	April, 2003	105	JICA Project
		Pumping Test	December, 2004	89	JICA Project
		Water Chemistry (Groundwater Development Training course)	July, 2016	77	EWTI
		Well Rehabilitation		57	EWTI
2	Drilling Technology	Borehole Camera survey and Well Rehabilitation	December, 2004	87	JICA Project
		Drilling Technology course (Introduction to Geology and Hydrogeology)	April, 2002	40	JICA Project
		Drilling Technology Text book		410	
3	Drilling Machineries Maintenance Tec.	Basic Knowledge	October, 2016	70	Melaku Behailu
		Drilling Machineries Maintenance Technology Training		268	Alemayehu Berisisa
		Drilling Machineries Maintenance Technology Training	February, 2017	211	EWTI
		Drilling Machine		104	JICA Project
		Diesel engine , Rig, truck and Auto Electricity			JICA Project
		Lubricant	1999	238	Meson Ledges
4	Electro Mechanical Maintenance Technology	Electrical Equipment Maintenance Technology	July 31, 2007	17	JICA Project
		Hand pump Installation and Maintenance	July 08, 2012	31	Teshome Manbegirot w/mariam
		Switch Board and electrical Machine Control	September, 2012	60	JICA Project
		Electricity on Diesel Engine		72	
		Basic Electronics (Beginners guide)	February, 2012	71	JICA Project
		Notes on: Basic Electrical Concepts : collection of books	August, 2016	180	Gutema Terfas, Endalemahu Endale, etc.

5-3 Preparation and approval process

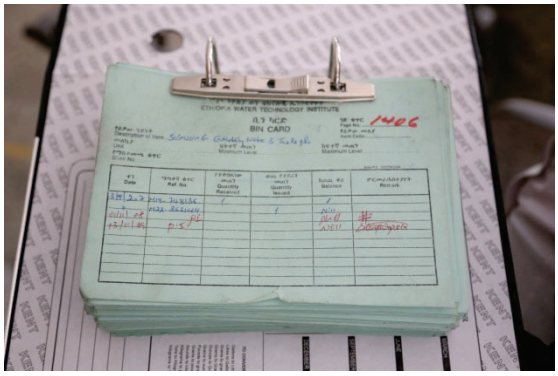
EWTI has been using the training materials for provision of the training courses which have been conducted since EWTEC period with some or no modification to their contents. There is no formal procedure or manual of approval process for preparation of new or modification of existing training materials.

5-4 How to keep training material

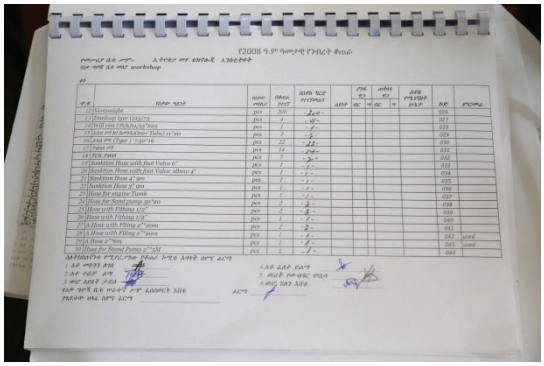
- Except reference books all the training text materials are kept with individual trainers.
- The training materials are not listed according to training modules.

5-5 Equipment

All the equipment including machineries, vehicles, office equipment etc. is recorded in annual inventory.



Bin card. When the equipment is taken, this bin card has to be filled.



Annual inventory
(There is a column for item name, quantity, price and condition. Price column is not filled.)

6 Trainers

This chapter describes the baseline information of only 4 technical areas, namely, GI, DT, DMMT and EMMT except 6-1.

6-1 Number of trainers

Table 12: Number of Trainers (as of December 2017)

Department	Training Courses in charge	Total No. of approved position	No. of existing staff	No. of vacant position
Office of WT Education & Training Directorate /Director/		1	1	0
Water Resource Development & Drilling Technology Education & Training Department	GI, DT, Well Rehabilitation GIS and Remote Sensing	15	9	6
Electro-Mechanical & Drilling Machineries Maintenance	DMMT, EMMT, EMMT for TVET	16	9	7

Department	Training Courses in charge	Total No. of approved position	No. of existing staff	No. of vacant position
Technology				
Irrigation & Drainage Engineering Technology Education & Training Department	Irrigation and Drainage	9	5	4
Water Supply & Sewerage Technology Education & Training Department	WSE, Contract Administration and Project Management, Sanitation and Solid Waste Management, Non-revenue Water Management, Water Service Management WSE for TVET	11	9	2
Renewable Energy Development Education & Training Department		8	1	7
Total		**60**	**34**	**26**

Training for meteorology trainees, and post graduate diploma in meteorology are given by another department were delivered by the outsourced trainers.

6-2 Educational background and working experience

- CVs of staff members under Water Technology Education & Training Directorate are attached in Annex 2. The summary of the trainers' educational background in Water Resources Development and Drilling Technology Department (WRDDT) and Electro-mechanical and Drilling Machinery Maintenance Technology Department (EM/DMMT) is shown in the tables below;

Table 13: Educational Background of the Project Counterpart Staff (for 4 courses)

Department	Course in charge	Master degree holder	Bachelor degree holder	Others	Total
Director	-	1	0	0	1
WRD/DT	GI, DT	3	4	2	9
EM/DMMT	DMMT, EMMT	1	5	3	9
Total	-	5	9	5	19

Table 14: Number of Work Experiences of the Project counterpart Staff (for 4 courses)

Department	Course in charge	1-10	11-20	More than 21	Total
Director	-	0	1	0	1
WRD/DT	GI, DT	4	3	2	9
EM/DMMT	DMMT, EMMT	4	2	3	9
Total	-	8	6	5	19

- There are two COC holders (both have level 2 in Drilling Technology) in WRD/DT department.
- Though the practical skill levels are not found from the staff records, many trainers are in need of improvement of practical skills, according to the Experts' observation.
- Required qualification for each post under Water Resource Development & Drilling Technology

Education & Training Department and Electro-Mechanical & Drilling Machineries Maintenance Technology Education & Training Department is summarized below.

Table 15: Required qualification for EWTI staff for 4 pilot technical areas

1) Water Resource Development & Drilling Technology Education & Training Department

Item No	Job Position	Qualification Requirement			No of Approved Positions	No of Existing Staff	No of Vacant Position
		Profession	Level of Education	Experience in Year			
1	Team Leader	Hydrology Eng. or Drilling Eng.	Bsc or Msc	7 or 5	1	1	0
2	Senior Hydrogeologist	Hydrogeology or Geology	Bsc or Msc	8 or 6	1	0	1
3	Senior Hydrologist	Hydrology or Geology	Bsc or Msc	8 or 6	1	1	0
4	Senior Geophysist	Geophysics	Bsc or Msc	8 or 6	1	0	1
5	Senior Drilling Technologist	Drilling Technology or Geology	Bsc or Msc	8 or 6	1	1	0
6	Senior Water Resource Dev't & Mgt Expert	Water Resource Dev't (or Mgt)	Bsc or Msc	8 or 6	1	0	1
7	Senior GIS & Remote Sensing Technologist	GIS, Remote Sensing or ICT	Bsc or Msc	8 or 6	1	1	0
8	Geologist	Geology, Hydrology	Bsc or Msc	6 or 4	1	1	0
9	Junior Geologist	Geology	Bsc	0	1	1	0
10	Drilling Super Intendent II	General Mechanic, Auto Mechanic	BSC, College Dip., 10+2, 10+1	2, 8, 9, 10	1	0	1
11	Chief Driller II	General Mechanic, Auto Mechanic	BSC, College Dip., 10+2, 10+1	2, 8, 9, 10	2	1	1
12	Junior Drilling Workshop Intendent I	Electrical or General Mechanic	Bsc, College Diploma	0, 6	1	1	0
13	Assistant Driller I	Electro-mechanic or General Mechanic	College Diploma, 10+2, 10+1	0, 1, 2	2	1	1
Total					15	9	6

2) Electro-Mechanical & Drilling Machineries Maintenance Technology Education & Training Department

Item No	Job Position	Qualification Requirement			No of Approved Positions	No of Existing Staff	No of Vacant Position
		Profession	Level of Education	Experience in Year			
1	Team Leader	Mechanical, Electrical or Electro-Mechanic	Bsc, Msc	7, 5	1	0	1
2	Senior Mechanical Engineer	Mechanical Eng. Or Auto-mechanic	Bsc, Msc	5, 3	2	2	0
3	Senior Electro-mechanical Engineer	Electro-Mechanical, Electrical	Bsc, Msc	5, 3	1	1	0
4	Senior Electrical Engineer	Electrical or Electro-mechanical Eng	Bsc, Msc	5, 3	1	1	0
5	Senior Auto-mechanic Technologist	Auto-mechanic or Mechanical Eng	Bsc, Msc	5, 3	1	0	1
6	Electrical Engineer	Electrical or Electro-mechanical Eng	Bsc, Msc	4, 2	1	0	1
7	Mechanical Engineer	Mechanical Eng. Or Auto-mechanic	Bsc, Msc	4, 2	1	0	1
8	Auto-mechanic	Auto-mechanic or Mechanical Eng	Bsc, Msc	4, 2	1	0	1
9	Junior Electrical Engineer	Electrical or Electro-mechanical Eng	BSC	0	1	1	0

Item No	Job Position	Qualification Requirement			No of Approved Positions	No of Existing Staff	No of Vacant Position
		Profession	Level of Education	Experience in Year			
10	Junior Mechanical Engineer	Mechanical Eng. Or Auto-mechanic	Bsc	0	1	0	1
11	Junior Auto-mechanic Technician	Auto-mechanic or Mechanical Eng	Bsc	0	1	0	1
12	Technical Assistant II	Electro-mechanic or Auto-mechanic	BSC, College Dip., 10+2, 10+1	2, 8, 9,10	4	4	0
Total					16	9	7

6-3 Capacity of trainers to deliver training

To overview the capacity of EWTI trainers, self-evaluation was conducted in the aspects of instructional design competency, training management competency and technical competency. Instructional design competency includes the areas of A. Research and analysis, B. Training development and C. Training delivery and evaluation, Training management capacity includes D. Information and knowledge management and E. Activities management. Technical capacity is evaluated in the aspect of knowledge and skills for the technical fields of 1. Groundwater Investigation, 2. Drilling Technology, 3. Drilling Machinery Maintenance Technology and 4. Electro-mechanical Maintenances Technology. The check list for self-evaluation and the results are shown in Table 16, Table 17 and Table 18.

Table 16: Check list for instructional design and management competency

Core Competency	Check List
A. Research and Analysis	1. Understanding of what and how to conduct an action research for planning of training program.
	2. Development of the Research Instruments (Field plan, check lists, questionnaire, etc.)
	3. Implementation of action research (Interview, questionnaire, Focus Group Discussion, etc.)
	4. Data analysis and report writing.
B. Training Development	5. Planning of Training (Set proper objectives, target, methodology, course contents, etc)
	6. Development of the training materials (Handout, Presentation, Teaching aid etc)
	7. Development of Assessment tools (level 1 - 4 Evaluation of training)
	8. Improvement of Training program based on the results of the field validation
C. Training Delivery and Evaluation	9. Designing of the delivery plan (Assignment plan, scheduling, training plan)
	10. Presentation and facilitation of the training program
	11. Evaluation of Training (Quantitative and Qualitative)
	12. Report Writing (Effectiveness, efficiency of the training, Lesson Learned)
D. Information and Knowledge Management	13. Use of ICT (Word, Excel, Power Point, e-Mail, Web browser, SNS etc.)
	14. Collecting Information and knowledge (Through resource documents, Report, Website etc.)
	15. Organizing the Information and Knowledge (Filing, archiving, indexing, storing, etc.)
	16. Sharing I&K (Regular meeting, newsletter, official Gmail, update FB, etc.)
E. Activities Management	17. Planning of the Activities (Monthly, trimester, annual plan)
	18. Process Management (Update of the Schedule, countermeasure and lesson learned)
	19. Output Management (Submit on time, received approval by the director/client, etc.)
	20. Report Writing (Report of planning, process and output management)

Table 17: Check list for technical competency

Category	Tasks
1. Groundwater Investigation	Module 1: Groundwater Hydrology/ Occurrence and Movement of Groundwater
	Module 2: Groundwater Investigation Methods
	Module 3: Drilling technology and well management
	Module 4: Geophysical logging test
	Module 5: Pumping test
	Module 6: Ethiopian Geology and Hydrogeology
	Module 7: Ethiopian Geology and Hydrogeology
	Module 8: Groundwater modelling
	Module 9: GIS and remote sensing
2. Drilling Technology	Module 1: Introduction to Geology and Hydrogeology
	Module 2: Drilling Administrative Techniques
	Module 3: Units of Measurements
	Module 4: Drilling machines and Tools
	Module 5: Drilling Technology
	Module 6: Function of the Drilling Machine
	Module 7: Drilling Data collection and report compilation
	Module 8: Drilling Troubleshooting
	Module 9: Drilling Rig Field Visits
	Module 10: Practical Drilling in the Field
3. Drilling Machinery Maintenance Technology	Module 1: Basic Knowledge
	Module 2: Diesel Engine
	Module 3: Rig Carrier Truck
	Module 4: Auto Electricity
	Module 5: Cable Tools (Percussion) Drilling Rig
	Module 6: Top Head Rotary Drilling Rig
	Module 7: Air compressor & DTH air hammer
4. Electro-Maintenances Technology Training	Module 1: Basic Electricity & Electrical Measurements
	Module 2: Basic Electronics
	Module 3: Electrical Machines & Control System
	Module 4: Submersible Pump
	Module 5: Introduction to Programmable logic controller
	Module 8: Maintenance Management

6-3-1 Instructional design and training management competency of EWTI trainers

The results of instructional design and training management competency show the following tendencies.

- Generally it shows low level to acceptable performance in all 5 categories.
- Among 5 categories, Research & Analysis and Training Development indicate relatively lower competency, which includes training needs survey analysis and training material preparation etc.

6-3-2 Technical competency of EWTI trainers

The results on the technical competency of EWTI staff show the following general tendencies.

- Generally all the staff members show the lack of knowledge and skills.
- Comparing the results among the four pilot training areas (GWI, DT, DMMT and EMMT), the trainers for DT show relatively better basic knowledge and skills than the others

- Whereas the trainers for DMMT staff indicated as having relatively lower basic knowledge and skills as compared to the others.

Table 18: Summary of the EWTI Trainers competency assessment

(1) Instructional Design and Management Competency

				Instructional Design												Management							
				Research & Analysis				Training Development				Training Delivery				KM				Activity Management			
No	Department	Name	Posision	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	GWI	Tamiru Fekadu	WRDDT Team leader	3	3	3	3	3	4	2	3	2	3	2	2	2	3	2	2	3	3	3	3
2	GWI	Mengesha Sisay	S. Geophysist	4	3	3	3	4	3	4	3	2	3	3	3	3	3	2	2	3	3	2	3
3	GWI	Zemenu Addis	S. Hydrologist	4	2	2	1	3	3	1	1	3	3	2	1	3	1	1	1	3	3	2	2
4	DT	Bizuneh Demissie	S. Drilling Technologist	3	3	3	2	3	3	1	2	3	3	3	3	2	3	3	1	3	3	3	3
5	DT	Dereje Fekade	Geologist	2	2	2	1	2	2	1	1	2	3	3	3	2	2	2	2	2	3	3	3
6	DT	Gizachew Getahun	Drilling Attendant	2	2	2	2	2	2	1	2	2	2	2	2	3	2	1	1	2	2	1	2
7	DT	Zewdu Seifu	Directore	2	2	3	2	2	3	1	1	2	3	1	2	4	3	2	3	3	2	2	2
8	DT	Atikilt Abirha	Trainining Officer	1	1	2	3	3	2	3	2	4	4	3	3	4	3	4	1	2	2	2	3
9	DMMT	Alemayehu Berisisa	S.Mechanical Enginer	3	2	3	2	3	3	1	2	3	3	2	2	3	3	2	2	3	1	1	1
10	DMMT	Melaku Behailu	S. Mechanical. Enginer	1	1	1	2	1	2	2	2	2	2	2	2	1	3	2	2	3	2	2	2
11	EMMT	Endalemahu Endale	Sen. Elec. Mech.Engin	2	3	3	2	3	3	2	1	3	3	3	2	2	2	2	2	3	3	2	2
12	EMMT	Gutema Terfassa	Junior Eletrc. Engin.	1	1	1	2	1	3	2	1	1	3	2	2	3	3	3	4	2	1	3	4
13	EMMT	Alemwork Gudu	S. Electrc. Engineer	2	2	2	2	3	3	2	2	2	2	3	3	3	3	3	2	3	2	2	2
14	Water Supply	Lolo Adgo	Expert	4	3	4	3	4	3	4	4	3	3	4	4	4	4	4	3	3	4	4	4
15	Water Supply	Nigussi Alemu	Civil Enginer	4	4	4	5	5	5	4	5	5	5	4	5	5	5	5	5	4	4	4	5
Average				2.53	2.27	2.53	2.33	2.80	2.93	2.07	2.13	2.60	3.00	2.60	2.60	2.93	2.87	2.53	2.20	2.80	2.53	2.40	2.73
				2.42				2.48				2.70				2.63				2.62			

Score level

5 Very high performance and self sufficient to do or to teach other staff by him/herself

4 Relatively high performance and able to do or teach other staff with minimum help of the expert or other staff

3 Acceptable performance and able to do or teach other staff with some support of expert or other staff

2 Low level performance and able to do by strong support of expert or staff but not able to teach other staff yet

1 Never did before and no idea on how it can be done

(2) Technical Competency (Knowledge)

				Technical Competency																																	
				GI									DT										DMMT							EMTT					
No	Department	Name	Posision	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	1	2	3	4	5	6
1	GWI	Tamiru Fekadu	WRDDT Team leader	3	3	2	3	3	3	3	3	3	3	2	4	2	2	2	2	2	2	2													
2	GWI	Mengesha Sisay	S. Geophysist	3	3	1	3	3	1	1																									
3	GWI	Zemenu Addis	S. Hydrologist	2	1						2	3																							
4	DT	Bizuneh Demissie	S. Drilling Technologist	2	4	2	2	1	1	2	1	1																							
5	DT	Dereje Fekade	Geologist	3	3	3	2	2	3	3	1	2	3	3	3	3	3	2	4	3	3	1													
6	DT	Gizachew Getahun	Drilling Attendant										2	3	3	3	3	3	3	2	3	2													
7	DT	Zewdu Seifu	Directore																																
8	DT	Atikilt Abirha	Trainining Officer																																
9	DMMT	Alemayehu Berisisa	S.Mechanical Enginer																				4	4	2	1	2	2	2						
10	DMMT	Melaku Behailu	S. Mechanical. Enginer																				4	3	1	1	1	1	1	3	4	2	1	1	3
11	EMMT	Endalemahu Endale	Sen. Elec. Mech.Engin																											3	3	4	3	2	3
12	EMMT	Gutema Terfassa	Junior Eletrc. Engin.																											4	3	2	2	2	1
13	EMMT	Alemwork Gudu	S. Electrc. Engineer																											3	3	3	2	2	2
14	Water Supply	Lolo Adgo	Expert																																
15	Water Supply	Nigussi Alemu	Civil Enginer																																
Average				2.60	2.80	2.00	2.50	2.25	2.00	2.25	1.75	2.25	2.67	2.67	3.33	2.67	2.67	2.33	3.00	2.33	2.67	1.67	4.00	3.50	1.50	1.00	1.50	1.50	1.50	3.25	3.25	2.75	2.00	1.75	2.25
				2.27									2.60										2.07							2.54					

(3) Technical Competency (Skill)

				Technical Competency																																	
				GI									DT										DMMT							EMTT					
No	Department	Name	Posision	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	1	2	3	4	5	6
1	GWI	Tamiru Fekadu	WRDDT Team leader	3	3	2	3	3	3	3	2	3	3	2	4	2	2	2	3	2	2	1													
2	GWI	Mengesha Sisay	S. Geophysist	2	2		1	1	1	1																									
3	GWI	Zemenu Addis	S. Hydrologist	2	2						2	3																							
4	DT	Bizuneh Demissie	S. Drilling Technologist													3		2	4	2	4	1													
5	DT	Dereje Fekade	Geologist	2	2	2	1	1	2	1	1	1	3	3	3	3	2	2	2	1	3	1													
6	DT	Gizachew Getahun	Drilling Attendant																																
7	DT	Zewdu Seifu	Directore																																
8	DT	Atikilt Abirha	Trainining Officer																																
9	DMMT	Alemayehu Berisisa	S.Mechanical Enginer																				3	3	2	1	1	1	1						
10	DMMT	Melaku Behailu	S. Mechanical. Enginer																				4	3	1	1	1	1	1	3	4	2	1	1	3
11	EMMT	Endalemahu Endale	Sen. Elec. Mech.Engin																											3	3	4	3	2	3
12	EMMT	Gutema Terfassa	Junior Eletrc. Engin.																											3	2	1	1	1	1
13	EMMT	Alemwork Gudu	S. Electrc. Engineer																											2	2	2	2	2	2
14	Water Supply	Lolo Adgo	Expert																																
15	Water Supply	Nigussi Alemu	Civil Enginer																																
Average				2.25	2.25	2.00	1.67	1.67	2.00	1.67	1.67	2.33	3.00	2.50	3.50	2.67	2.00	2.00	3.00	1.67	3.00	1.00	3.50	3.00	1.50	1.00	1.00	1.00	1.00	2.75	2.75	2.25	1.75	1.50	2.25
				1.94									2.43										1.71							2.21					

6-4 External trainers/lecturers

- All four courses of the project target are partially covered by the external trainers/lecturers. The proportion of the coverage for the first training courses in the fiscal year 2017/18 is shown as table below.
- The proportion is calculated according the time allocated only. Therefore, figures do not necessarily represent the degree of reliability on the external trainers, as the importance of the external trainers in terms of contents and quality of the training is not considered in the shown table.
- As shown in the table, the field activities of GI course, the lectures and practices of DMMT course are largely covered by the external trainers, while all the lectures of EMMT course and the field practices of DT, DMMT, EMMT courses are covered all by the EWTI staff.
- The objectives and contents of the field practices are not very clear, as there are little documents related to them.

Table 19: Proportion of time coverage by external trainers for four target courses

Course	Name	Lecture (days)			Practice (days)			Field (days)			Total		
		External	Allocated time	Covered by external	External	Allocated time	Covered by external	External	Allocated time	Covered by external	External	Allocated time	Covered by external
GI	Shumet Kebede	4	17	23.53%	0	0	0.00%	15	15	100.00%	19	32	59.38%
	Sub Total	**4**	**17**	**23.53%**	**0**	**0**	**0.00%**	**15**	**15**	**100.00%**	**19**	**32**	**59.38%**
DT	Geremew Game	2	12	16.67%	0	10	0.00%	0	26	0.00%	2	48	4.17%
	Endris Mohammed	0	12	0.00%	3	10	30.00%	0	26	0.00%	3	48	6.25%
	Wakgari Furi	3	12	25.00%	0	10	0.00%	0	26	0.00%	3	48	6.25%
	Sub Total	**5**	**12**	**41.67%**	**3**	**10**	**30.00%**	**0**	**26**	**0.00%**	**8**	**48**	**16.67%**
DMMT	Tamrat Abate	1.5	16.6	9.04%	0.5	10.4	4.81%	0	9	0.00%	2	**36**	5.56%
	Endris Mohammed	10.1	16.6	60.84%	5.9	10.4	56.73%	0	9	0.00%	16	**36**	44.44%
	Sub Total	**11.6**	**16.6**	**69.88%**	**6.4**	**10.4**	**61.54%**	**0**	**9**	**0.00%**	**18**	**36**	**50.00%**
EMMT	Getachew Woldemichael		3.5	0.00%	1.5	7.5	20.00%	0	7	0.00%	1.5	18	8.33%
	Tsegaye Endale		3.5	0.00%		7.5			7			18	
	Asfaw Mulatu		3.5	0.00%	1.5	7.5	20.00%	0	7	0.00%	1.5	18	8.33%
	Yehualashet Woldemichael		3.5	0.00%		7.5			7			18	
	Sub Total	**0**	**3.5**	**0.00%**	**3**	**7.5**	**40.00%**	**0**	**7**	**0.00%**	**3**	**18**	**16.67%**

*Total number of days for the training is calculated based on the actual training days (excluding off days).
*Proportion of the coverage is calculated with the number of the training days, due to the fact that there is no standard hours of lecture/practice/field practice.

6-5 External professional partners

Table 20: List of external professional partners

Category	Name of Organization or Person	Field of Expertise	Past Experience with EWTI	Remark
Government Organization	AAWSA Training Center	Electro-mechanical, Water treatment	Not known	Possible partnership in terms of supplying experienced Electro-mechanical employees for EWTI's practical training
	Batu TWSS	Electro-mechanical, Water treatment	Cooperate for field demonstration of electro-mechanical equipment operation and observation visits for water treatment operation	MoU was signed to continue formally the cooperation for field demonstration of electro-mechanical equipment operation and observation visits for water treatment operation
	Adama TWSS	ditto	ditto	ditto
	Yirgalem TWSS	ditto	ditto	ditto
	Hawassa TWSS	ditto	ditto	ditto
	SNNP WWCE	Drilling machinery (rig & accessories) operation	Cooperate for field demonstration of drilling machineries operation and observation visits for drilling machinery maintenance technology	Possible partnership can be established (with signing of MoU) in the future for field demonstration of various types of drilling machineries (rigs and accessories)
	Somali WWCE	ditto	ditto	ditto
	Federal WWCE	ditto	ditto	ditto
	Oromia Drilling Enterprise	ditto	ditto	ditto
	Addis Ababa Science & Technology University (ASTU)	Training, education and research	Not known	MoU was signed to cooperate with training and education program as well as to conduct water technology related research activities
	Wello University	Training, education and research	Not known	ditto
Private Company	AG Consult	Electro-mechanical	Developed TTLM for some courses of EWTI	Possible partnership for transferring training program from one to the other if one of them busy to do scheduled training
	Derba Drilling Company	Drilling machinery (rig & accessories) operation	Cooperate for field demonstration of drilling machineries operation and observation visits for drilling machinery maintenance technology	Possible partnership can be established (with signing of MoU) in the future for field demonstration of various types of drilling machineries (rigs and accessories)
Individuals	Mr. Endris Mohammed	Mechanical Engineering	Former staff as trainer, External trainer of DMMT, participated in TGS/DMMT	
	Mr. Mulugetta Kinfu	Hydro-geology	Former staff as trainer, External trainer of DT, participated in TGS/DT	
	Mr. Shumet Kebede	Hydro-geology	Former staff as trainer, External trainer in Geo-physical groundwater	

Category	Name of Organization or Person	Field of Expertise	Past Experience with EWTI	Remark
			investigation	
	Mr.Geremew Game	Hydro-geology	Former staff as trainer, External trainer of well rehabilitation	
	Mr.Tsegaye	Electrical Engineering	Former staff as trainer, External trainer of Generator	
	Mr.Getachew W/Michael	Electro-mechanic	Former staff as trainer, External trainer of Generator	
	W/o Yehualesht	Electro-mechanic	External trainer of Compressor	
	Dr.Berhanu Gessess	GIS & Remote Sensing	External trainer of GIS & Remote Sensing	
	Dr.Wakgari Furi	Hydro-geolog y	External trainer of Drilling Fluid Technology	
	Mr.Beneberu	Electrical Engineering	Participated in TGS/EMMT	
	Mr.Asfaw	Electro-mechanic	External trainer of Generator	
	Mr.Tamirat		External trainer of ECM	

7 Monitoring and evaluation system

7-1 Method of training evaluation

- Pre-test is given to the trainees at the beginning of a training course and then, post-test is given immediately after the completion of the training course. The test is prepared by each trainer.
- Both pre-test and post-test results are posted in the classroom during the training course, but neither recorded or kept by Institute. The results of the tests are not systematically utilized as a means of assessment of the training result, while the attendance is the major factor to determine the successful completion of the training for each trainee.
- Questionnaires are distributed to trainees after completion of a training course to evaluate training as a whole including venue, teaching material, teaching methodology, trainers' capacity, etc. A format of questionnaire is as below.
- The questionnaires are collected and kept by Registrar. The summary report of the trainees' response is prepared only once at the end of a year (not after every training course). All the results of the last year have not been prepared as of end of December 2017. The trainers check the results individually by visiting Registrar office.
- Annual report is submitted to Director General with CC to WTETD. Director of WTETD Directorate will inform to each Team Leader.
- There is Trainee's Record Book of EWTI which was developed from the Trainee's Record Book of TVET. Unlike TVET's case, EWTI's record book shows only evaluation on attendance in a training course.

Ethiopian Water Technology Institute (EWTI)

Trainers Evaluation Form

Please Summaries the training using the rating System below as a means of Maintaining and improving the quality of Our Services

Course Title: ----------

Date: ----------

On a scale of 1-5, with 1 being the lowest and 5 being the highest, please rate the following:

1.Training Delivery

Evaluation Criteria	1	2	3	4	5
1. Training Place and Venue					
2. Provision of Training Material (Soft/hard Copy)					
3. Relevance/ Importance of the training					
4. Training Topics/Area					
5. Time schedule and Management					
6. Practical exercise/Demonstration/Field Visit					
7. Experience Sharing/Knowledge transfer					
8. Registrar Office, Registration facility and facilitation					

2.Capacity of the Trainers

Trainer Name : Mr

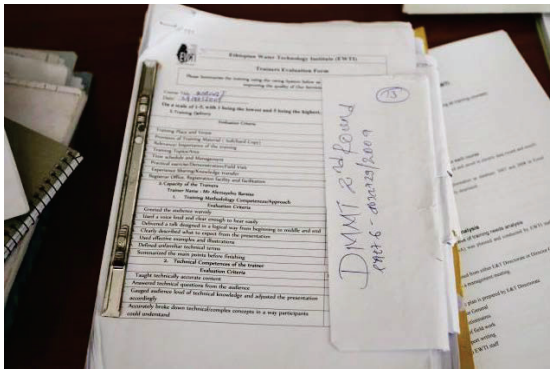
1. Training Methodology Competences/Approach

Evaluation Criteria	1	2	3	4	5
1. Greeted the audience warmly					
2. Used a voice loud and clear enough to hear easily					
3. Delivered a talk designed in a logical way from beginning to middle and end					
4. Clearly described what to expect from the presentation					
5. Used effective examples and illustrations					
6. Defined unfamiliar technical terms					
7. Summarized the main points before finishing					

2. Technical Competences of the trainer

Evaluation Criteria	1	2	3	4	5
1. Taught technically accurate content					
2. Answered technical questions from the audience					
3. Gauged audience level of technical knowledge and adjusted the presentation accordingly					
4. Accurately broke down technical/complex concepts in a way participants could understand					

Training Evaluation Form



Filed questionnaires collected from trainees of different courses. Training evaluation results of all the training courses are summarized only once at the end of a year.

7-2 Frequency of training evaluation

- Training evaluation is conducted after every training course as immediate evaluation (level 1 and 2 evaluation).
- No regular monitoring and evaluation at trainees' working places (level 3 and level 4 evaluation) is conducted.

7-3 Way to reflect the results

- No formal way of reflection (such as in training planning) but management staff discuss internally and in case of serious issue the management give direction to the trainer for self-adjustment.

7-4 How is the evaluation data kept

- The data in hard copy is kept in a separate box file in Registrar Office. The same data is also available in soft copy in the same office.

7-5 Summary of evaluation results by the trainees

Although there was no report or summary of collected questionnaires, the registrar office has kept row data (evaluation sheets filled by trainees) of 20 recent training courses in the past 2 years. The data was summarized by the Project staff.

7-5-1 General evaluation for training courses

The results include training courses other than 4 target training areas as references. The target training areas of the Project is colored gray.

Training delivery is assessed by one to five score for the following eight criteria in the evaluation sheet.

1. Training place and venue
2. Provision of training material (soft/hard copy)
3. Relevance/importance of the training

4. Training topics/area
5. Time schedule and management
6. Practical exercise/demonstration/field visit
7. Experience sharing/knowledge transfer
8. Registrar office, registration facility and facilitation

The score in Table 21 is the average of scores answered by the trainees for the above 8 criteria calculated after calculating the average of scores by the trainees for each criterion. In addition, percentage of score 4 and 5 is calculated assuming that score 4 and 5 are categorized as satisfactory. The results indicate that trainees show relatively high satisfaction for most training courses except few courses which mark below 4 for average score or below 80% for the rate of score 4 and 5.

Table 21: Evaluation results of training delivery for the past 2 years

Technical Area	Training Duration	Training Course	Evaluation of Training Delivery by trainees	
			Average score	% of score 4 and 5
Groundwater Investigation (GWI)	Oct 21, 2016 ~ Jan 08,2017	1st (2016/2017) GWI	4.33	85.0%
	Feb13, 2017 ~ Mar 24, 2017	2nd (2016/2017) GWI	3.97	82.2%
Drilling Technology (DT)	Oct 21, 2016 ~ Jan 08,2017	2nd (2016/2017) DT	4.99	100.0%
	Oct 23, 2017 ~ Dec 25,2017	2nd (2017/2018) DT	4.41	89.0%
Drilling Machinery Maintenance Technology (DMMT)	Oct 21, 2016 ~ Jan 08,2017	1st (2016/2017) DMMT	3.58	64.3%
	Feb 13, 2017 ~ Mar 24,2017	2nd (2016/2017) DMMT	4.29	84.5%
Electro-Mechanical Maintenance Technology (EMMT)	Oct 30, 2017 ~ Nov 23, 2017	1st (2017/2018) EMMT	4.52	93.8%
GIS	Jan 15, 2018 ~ Feb 08, 2018	2nd (2017/2018) GIS	4.63	94.6%
	Feb 12, 2018 ~ Mar 09, 2018	3rd (2017/2018) GIS	4.71	96.9%
Water Well Rehabilitation (WWR)	Feb 06, 2017 ~ Feb 06, 2017	1st (2016/2017) Water Well Rehabilitation	3.67	76.3%
Non-Revenue Water Management	May 29, 2017 ~ Jun 19,2017	1st (2016/2017) Non-Revenue Water Management	4.22	83.9%
	Feb 12, 2018 ~ Feb 26,2018	1st (2017/2018) Non-Revenue Water Management	4.33	78.1%
Contract Administration and Project Management (CAPM)	Dec 11, 2017 ~ Dec 26,2017	1st (2017/2018) Contract Administration and Project Management	4.44	92.0%
	Jan 15, 2018 ~ Feb 05, 2018	2nd (2017/2018) Contract Administration and project Management	3.86	75.4%
Water Supply Engineering (WSE)	Sep 25, 2017 ~ Oct 19,2017	1st (2017/2018) Water Supply Engineering Software Application	4.54	89.6%
	Dec 11, 2017 ~ Jan 02, 2018	2nd (2017/2018) Water Supply Engineering	4.46	87.5%

Technical Area	Training Duration	Training Course	Evaluation of Training Delivery by trainees	
			Average score	% of score 4 and 5
		Software Application		
Sanitation and Solid Waste Management (SSWM)	Sep 25, 2017 ~ Oct 16,2017	1st (2017/2018) Sanitation and Solid Waste Management	4.55	89.1%
	Feb 19, 2018 ~ Mar 09, 2018	3rd (2017/2018) Sanitation and Solid Waste Management	4.75	95.3%
Water Utility Management (WUM)	May 29, 2017 ~ Jun 19, 2017	1st (2016/2017) Water Utility Management	4.23	79.2%
Surface Water and Irrigation Design Technology (IDT)	Jan 29, 2018 ~ Feb 12, 2018	3rd (2017/2018) Surface Water and Irrigation Design Technology	4.21	81.5%

If each one of 8 criteria is compared, “1. Training place and venue” and “5.Time schedule and management” show relatively lower score.

7-5-2 Evaluation for trainers

The evaluation results of both EWTI trainers and external trainers in the target 4 training areas are summarized in Table 22. Trainers are assessed by the two aspects, “Training methodology competences” and “Technical competences”. Each aspect was evaluated by one to five score with the following criteria.

1) Training methodology competences
   1. Greeted the audience warmly
   2. Used a voice loud and clear enough to hear easily
   3. Delivered a talk designed in a logical way from beginning to middle and end
   4. Clearly described what to expect from the presentation
   5. Used effective example and illustrations
   6. Defined unfamiliar technical terms
   7. Summarized the main points before finishing

2) Technical competences
   1. Taught technically accurate content
   2. Answered technical question from the audience
   3. Gauged audience level of technical knowledge and adjusted the presentation accordingly
   4. Accurately broke down technical/complex concepts in a way participants could understand

The scores for the above 2 aspects, “Training methodology competences” and “Technical competence” in Table 22 are calculated in the same way as that of training delivery. The results indicate that;

- Almost all trainers show high score more than 4 in the 2 aspects except few cases. Even a trainer who got relatively lower score in some training course show higher score in other occasion.
- There is no clear difference in score among different technical fields.
- There is a tendency that a trainer who shows lower score in "Training methodology competences" also shows lower score in "Technical competence".
- Although the scores of guest lecturers tend to show relatively higher than those of EWTI trainers, the gap is small.

Table 22: Evaluation results of trainers for the past 2 years

EWTI trainer/ External trainer	Trainer's Name	Position	Training Course	Duration	1. Training Methodology Competences/Approach	2. Technical Competences
EWTI trainer	Mr. Tamiru Fekadu	Senior Hydrogeologist	1st (2016/2017) GWI	21/Oct, 2016 ~ 08/Jan, 2017	4.61	4.40
			2nd (2016/2017) GWI	13/Feb, 2017 ~ 24/Mar, 2017	4.51	4.53
	Mr. Dereje Fekade	Senior Geologist	2nd (2016/2017) GWI	13/Feb, 2017 ~ 24/Mar, 2017	3.75	3.61
	Mr. Zemenu Addis	Senior Hydrologist	2nd (2016/2017) GWI	13/Feb, 2017 ~ 24/Mar, 2017	4.67	4.59
			2nd (2017/2018) GIS	15/Jan, 2018 ~ 08/Feb, 2018	4.40	4.38
	Mr. Samuel Zewdu	Senior GIS and RS Expert	2nd (2016/2017) GWI	13/Feb, 2017 ~ 24/Mar, 2017	4.62	4.56
			2nd (2017/2018) GIS	15/Jan, 2018 ~ 08/Feb, 2018	4.67	4.57
			3rd (2017/2018) GIS	12/Feb, 2018 ~ 09/Mar, 2018	4.72	4.75
External trainer	Mr. Hussen Endire	Guest lecturer	1st (2016/2017) GWI	21/Oct, 2016 ~ 08/Jan, 2017	4.78	4.62
			2nd (2016/2017) GWI	13/Feb, 2017 ~ 24/Mar, 2017	4.73	4.61
	Mr. Shumet	Guest lecturer	2nd (2016/2017) GWI	21/Oct, 2016 ~ 08/Jan, 2018	4.87	4.78
	Mr. M/Berhan	Guest lecturer	2nd (2017/2018) GIS	15/Jan, 2018 ~ 08/Feb, 2018	3.94	3.97
	Mr.Getachew Akelilu	Guest lecturer	2nd (2017/2018) GIS	15/Jan, 2018 ~ 08/Feb, 2018	4.84	4.86
			3rd (2017/2018) GIS	12/Feb, 2018 ~ 09/Mar, 2018	4.93	4.88
	Mr. Berehanu	Guest lecturer	2nd (2017/2018) GIS	15/Jan, 2018 ~ 08/Feb, 2018	4.32	4.31
	Mr. Yoanas	Guest lecturer	3rd (2017/2018) GIS	12/Feb, 2018 ~ 09/Mar, 2018	4.94	4.90

Drilling Technology (DT)

EWTI trainer/ External trainer	Trainer's Name	Position	Training Course	Duration	1. Training Methodology Competences/Approach	2. Technical Competences
EWTI trainer	Mr. Bizuneh Demissie	Senior Drilling expert	2nd (2016/2017) DT	21/Oct, 2016 ~ 08/Jan, 2017	5.00	4.95
			1st (2016/2017) WWR	06/Feb, 2017 ~ 06/Feb, 2017	4.66	4.50
			2nd (2017/2018) DT	23/Oct, 2017 ~ 25/Dec, 2017	4.70	4.49
	Mr. Dereje Fekade	Senior Geologist	2nd (2016/2017) DT	21/Oct, 2016 ~ 08/Jan, 2017	5.00	4.95
			1st (2016/2017) WWR	06/Feb, 2017 ~ 06/Feb, 2017	4.57	4.32
			2nd (2017/2018) DT	23/Oct, 2017 ~ 25/Dec, 2017	3.92	3.84
	Mr. Mekonnen Awoke	Chief Driller	2nd (2016/2017) DT	21/Oct, 2016 ~ 08/Jan, 2017	5.00	4.97
			1st (2016/2017) WWR	06/Feb, 2017 ~ 06/Feb, 2017	4.64	4.60
			2nd (2017/2018) DT	23/Oct, 2017 ~ 25/Dec, 2017	4.57	4.57
External trainer	Mr. Geremew Game	Guest lecturer	2nd (2016/2017) DT	21/Oct, 2016 ~ 08/Jan, 2017	5.00	5.00
			1st (2016/2017) WWR	06/Feb, 2017 ~ 06/Feb, 2017	4.71	4.75
			2nd (2017/2018) DT	23/Oct, 2017 ~ 25/Dec, 2017	4.80	4.71
	Mr. Endrise	Guest lecturer	2nd (2016/2017) DT	21/Oct, 2016 ~ 08/Jan, 2017	5.00	5.00
			2nd (2017/2018) DT	23/Oct, 2017 ~ 25/Dec, 2017	4.80	4.81
	Dr. Wagari	Guest lecturer	2nd (2017/2018) DT	23/Oct, 2017 ~ 25/Dec, 2017	4.99	4.95

Drilling Machinery Maintenance Technology (DMMT)

EWTI trainer/ External trainer	Trainer's Name	Position	Training Course	Duration	1. Training Methodology Competences/Approach	2. Technical Competences
EWTI trainer	Mr. Alemayehu Barsisa	Senior Mechanical Engineer	1st (2016/2017) DMMT	21/Oct, 2016 ~ 08/Jan, 2017	4.23	4.04
			2nd (2016/2017) DMMT	13/Feb, 2017 ~ 24/Mar, 2017	4.51	4.48
	Mr. Melaku Behayilu	Senior Mechanical Engineer	1st (2016/2017) DMMT	21/Oct, 2016 ~ 08/Jan, 2017	3.78	3.85
			2nd (2016/2017) DMMT	13/Feb, 2017 ~ 24/Mar, 2017	4.74	4.79
External trainer	Mr. Mokonnen Legesse	Guest lecturer	1st (2016/2017) DMMT	21/Oct, 2016 ~ 08/Jan, 2017	3.05	3.24
	Mr. Endris Mohammed	Guest lecturer	1st (2016/2017) DMMT	21/Oct, 2016 ~ 08/Jan, 2017	4.73	4.56
	Mr. Tamirat Abate	Guest lecturer	1st (2016/2017) DMMT	21/Oct, 2016 ~ 08/Jan, 2017	4.73	4.59
	Ms. Yehuwalashet & Mr. W/Micheal	Guest lecturer	1st (2016/2017) DMMT	21/Oct, 2016 ~ 08/Jan, 2017	4.35	4.25

Electrical Machinery Maintenance Technology (EMMT)

EWTI trainer/ External trainer	Trainer's Name	Position	Training Course	Duration	1. Training Methodology Competences/Approach	2. Technical Competences
EWTI trainer	Mr. Edalemaw Edale	Senior Electromechanical Eng.	1st (2017/2018) EMMT	30/Oct, 2017 ~ 23/Nov, 2017	4.67	4.66
	Mr. Alemework Gudu	Senior Electrical Engineer	1st (2017/2018) EMMT	30/Oct, 2017 ~ 23/Nov, 2017	4.65	4.58
	Mr. Melaku Behailu	Senior Mechanical Engineer	1st (2017/2018) EMMT	30/Oct, 2017 ~ 23/Nov, 2017	4.51	4.36
	Mr. Tesgay Arega	Technical Advisor to Director General	1st (2017/2018) EMMT	30/Oct, 2017 ~ 23/Nov, 2017	4.70	4.57
	Mr. Gutema Terefessa	Junior Electrical Engineer	1st (2017/2018) EMMT	30/Oct, 2017 ~ 23/Nov, 2017	4.70	4.59

8 Knowledge management

8-1 Training document management

- See 5-4.
- No linkage of training documents (materials) and library services.
- Internal network is absent.
- Poor internet services may hamper active information collection for training staff.

8-2 Information management of training evaluation

8-2-1 Mechanism for collection, management and store of information

- Regarding evaluation of EWTI's trainees, currently there is a pre-test and immediate post training evaluation but these results are not reported to any directorate.
- The evaluation of trainers (of both the external and internal) is conducted with the evaluation form prepared by Registrar office and a compiled report of this evaluation is prepared by registrar office and reported to Water Technology Education and Training Directorate. However, there is no proper mechanism for management and storage of this information in EWTI.

8-2-2 Mechanism for utilization of information

- The mechanism for utilization of the training evaluation information is not clear or well established in EWTI.

8-3 Library operation and management

- There is a library in the old building (no improvement from EWTEC period)
- A temporary team leader of the Library and Printing Team is taking care of the library. The post for librarian has been vacant (for about 6 months).
- All the books are registered in a registration book (in Excel format). Total of 707 books is registered.

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MINISTRY OF WATER .IRRIGATION AND ELECTRICITY

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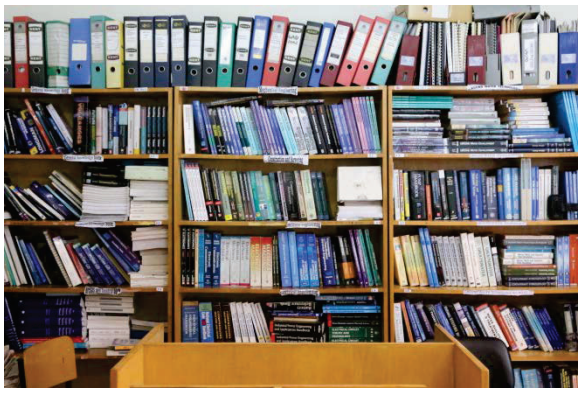
				ቁጥር Number	ቀን Date				
1	Mechanical engineering reference book					በቁጥር	2		
2	Principle of fluid mechanics					በቁጥር	2		
3	Mechanics of materials					በቁጥር	2		
4	Strength of materials and structure					በቁጥር	2		
5	Introduction to mechanical engineering					በቁጥር	2		
6	Heat and mass transfer					በቁጥር	2		
7	Engine testing theory and practice					በቁጥር	2		
8	Fluid mechanics and termino dynamics of machinery					በቁጥር	2		
9	Mechtronics					በቁጥር	2		
10	Dictionary of mechanical engineering					በቁጥር	2		

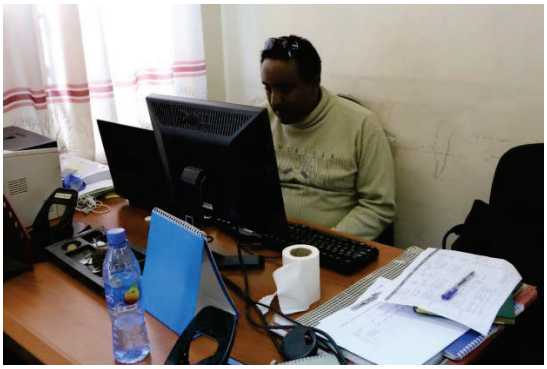
Excel format for book registration

- The books are placed separately according to each technical field such as “groundwater technology, GIS, Electrical engineering, Construction and Surveying, General knowledge etc. but some are misplaced (not properly organized).
- The size of the shelf cannot accommodate books or documents with large size (the shelf size is too small).
- Technical reference books are limited.

All books in the library. There are 707 books registered.

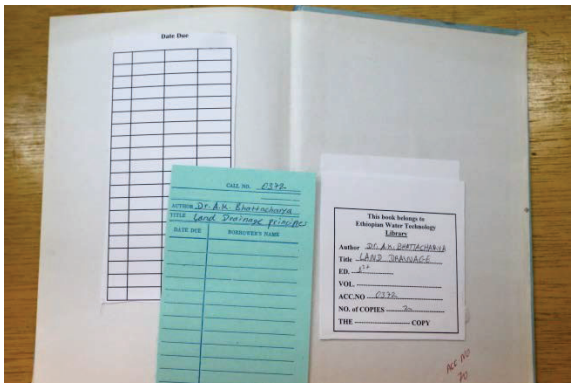


Books categorized in different technical field. Some are misplaced.



Temporary book keeper (acting team leader of Library and Printing Team)

The shelf does not accommodate tall files and books. The size is not appropriate designed.



Borrower's card is attached with each book (library pocket)

Borrower's cards are kept in a drawer without using registration book.

There are 6 individual desks to study

Old training materials (copy of text books) are simply piled without being classified.

8-4 Situation of library usage

- The post of librarian has been vacant for about 6 months. During the 6 months, there has been no library service for trainees but there is for EWTI staff. Some EWTI staff members have borrowed reference books.
- There is borrowing procedure by using borrower's card (library pocket). There is a registration book but not utilized. The borrower's cards are simply kept in a drawer without keeping any record.

- There is no fixed due date to return the borrowed books. A borrower makes agreement with a librarian for the duration of borrowing. Generally, the duration of borrowing is 1 week for important and demanded books and about 1 month for less demanded books.
- Some EWTI staff visit the library and read books and newspapers.

9 Public Relations

9-1 Publication of newsletter

- Publication of newsletters is every 3 months. So far, 3 volumes have been published since July 2008 (Ethiopian year) as of July 2017.
- 1000 to 2000 copies are printed every time and distributed to stakeholders.

Table 23: List of Organization for Newsletter Distribution

No.	Name of Organization	Location of Organization	Number of Copies
1	Ministry of Foreign Affairs	Fil Wuha	50
2	Ethiopian Mapping Authority	Fil Wuha	50
3	Ministry of Education	Arat Kilo	50
4	The House of Peoples' Representatives	Arat Kilo	50
5	The House of Federation	Arat Kilo	50
6	Office of EPRDF	Arat Kilo	50
7	Ministry of Finance & Economic Cooperation	Sidist Kilo	50
8	Ministry of Health	Senga Tera	50
9	Ministry of Culture & Tourism	Senga Tera	50
10	Social Security Agency	Senga Tera	50
11	National Library & Archive Agency	Senga Tera	50
12	National Meteorology Agency	Senga Tera	50
13	Ministry of Federal Affairs &	Mexico	50
14	Micro & Small-Scale Enterprise Expansion Agency	Mexico	50
15	Transport Construction Design Enterprise	Mexico	50
16	Ethiopian Roads Authority	Mexico	50
17	Federal Police Headquarter	Mexico	50
18	Ministry of Trade	Cazanches	50
19	Ministry of Labor & Social Affairs	Cazanches	50
20	Ministry of Agriculture	Megenagna	50
21	Ministry of Natural, Animal & Fish Resources	Megenagna	50
22	Ministry of Justice	Bambis	50
23	Ministry of Water, Irrigation & Electricity	Haya Hulet	50
24	Ministry of Environmental Protection & Forestry	lam Beret	50
25	Ministry of Youth & Sport	Bambis	50
26	Ministry of Defense	Ambasader	50
27	Ministry of Information, Communication & Technology	Ambasader	50
28	Ethio Telecom	Ambasader	50
29	Ethiopian Postal Service Enterprise	Ambasader	50
30	National Bank of Ethiopia	Ambasader	50
31	Commercial Bank of Ethiopia	Ambasader	50
32	Ministry of Transport	Ambasader	50
33	Ministry of Urban & Housing Development	Ambasader	50
34	Disaster Preventive & Preparedness Agency	Stadium	50
35	Ethiopian Insurance Corporation	Legehar	50

No.	Name of Organization	Location of Organization	Number of Copies
36	Ethiopian Maritime & Transit Service	Legehar	50
37	Ethiopian Railway Corporation	Legehar	50
38	Ministry of Corporation	Temenja Yaz	50
39	Ministry of Science & Technology	Temenja Yaz	50
40	Ministry of Women & Children	Meskel Square	50
41	Ministry of Public Service & Human Resource Dev't	Wello Sefer	50
42	Government Communication Affairs Office	Filamingo	20
43	Ministry of Public Enterprises	Gerji	20
44	Ethiopian Investment Commission	Dembel	20
45	Ethiopian Airlines	Bole	20
46	Ministry of Industry	Haya Hulet	20
47	Ethiopian Electric Construction		20
48	Ethiopian Electric Service	Piasa	20
49	Ethiopian Export Expansion Agency		20
50	Ethiopian Revenue & Customs Authority	Lancha	20
51	Federal Higher Court	Lideta	20
Total			**2250**

- Contents of newsletters are prepared by staff of Corporate Communication Directorate

9-2 Website

- A web designer (Ms. Selamawit) was employed in June 2017. She has 7 years of experience of web designing in governmental institutions such as METEC, Addis Ababa Micro-Small Enterprise etc.
- Web design work has not yet started because there is a problem to install web design software. Cause of problem is not known.
- Software: Wordpress, MySQL
- After designing of Website, EWTI will make a contract with Ethiotelecom for hosting domain.

9-3 Process to decide PR contents

9-4 Other information transmission

- Notepad (2 types) (Amharic)
- Calendar (Amharic)
- New year card (Amharic)
- Brochure (English and Amharic)
- Citizen charter (Amharic) (English version is under preparation)
- Commercial Message (CM) in ETV program on New year day (80,000Birr, 1min, 3 to 4 times)

10 Human resource development and management of EWTI

10-1 Job description of EWTI staff

- Job description of Water Technology Education & Training Directorate is attached in Annex 4.

10-2 Staff development plans

- In the Human Resource Management (HRM) Directorate, there is a yearly staff development plan to improve the capacity of EWTI staff and the human resource development plan for the fiscal year of 2017/2018 is as follows:

Table 24: Training target for 2017/18

Training Type	Number of EWTI staff to be Trained
Short-term training	100
Long-term training (MSc and PHD program)	6

- The HRM directorate's short-term training plan is only a plan for lump sum figure of total EWTI staff to train with short-term trainings without specifying the type or list of short-term trainings.

10-3 Method and process of staff evaluation

- The staff evaluation is conducted in EWTI every six month. The staff is evaluated with a result – based performance evaluation system which involves the following process:
  - Each staff will sign his six month work plan agreement document with his supervisor at the start of every six month planning time;
  - At the end of the six month period, the staff will be evaluated by the supervisor, colleague and by himself;
  - The final result of staff evaluation is based on the average sum point scored from two categories: "behavior" which accounts 40 % and "Output" which accounts 60 %.

10-4 Frequency of staff training

- Three to four time in a budget year as per human resource development plan of HRM.

- In addition, some directorates of EWTI conduct their own training occasionally other than the plan of HRM Directorate such as Web site management.

10-5 Contents and method of staff training

There are serval training courses given for EWTI staff by either external or internal trainers. However, these training courses are planned in each directorates managed by themselves. Therefore, this creates overlapping of activities and lack of information to the staff.

Although there is no documented record of the training for EWTI trainers, the information shown in Table 25 was collected through interview.

Table 25: Training for EWTI staff

Training title	Time and duration	Participants	Organizer	Trainer	Remarks
HIV, BPR, BSC and Good Governance	5 days for BSC, 1 day for HIV, 4 days for good governance	All EWTI staff	EWTI (management staff)	MoWIE MoPS&HRD	Obligatory for all governmental organizations.
Research methodology	Twice between 2015 and 2017	N/K	EWTI (Research & Technology Transfer Directorate)	EMI	The training was conducted one time at Alemgena and the other time at Debre Zeit EMI compound.
Project proposal preparation	In 2017 for 5 days	30 EWTI staff members	EWTI (HRM Directorate)	Private consulting firm	This training was conducted in Alemgena town.
Teaching methodology	In 2015	Director of WT Education & Training Directorate & Head of Registrar	Federal TVET Agency	Expatriates	This training includes Teaching methodology (pedagogy), TTLM, curriculum, etc.
Teaching methodology	Three times between 2015 and 2017	All EWTI trainers and invited TVET instructors	EWTI (WTET Directorate)	Director of WTET Directorate & Head of Registrar	2 EWTI staff members who participated in the training organized by Federal TVET agency provided this training to other EWTI staff members.

10-6 Job satisfaction of staff

- Evaluation on the job satisfaction of staff has not carried out in EWTI (no statistical information is available).

10-7 Perception of staff on human resources development at EWTI

- Since HRM directorate first collects training needs of staff from each directorate in order to plan its annual human resource development plan it attempted to get the perception of staff on human resources development in EWTI.

- There are ample opportunities for management staff in meetings.
- Relatively easy access to the channel of communication such as consultation among Department / Directorate staff members.
- Less frequent opportunities in communication between training staff and management staff

11 Satisfaction of trainees

11-1 Degree of satisfaction of past trainees

- Degree of satisfaction of trainees for the EWTI training courses can be measured from the results of evaluation carried out after every training course. The result is described in 7-5-1.

11-2 Degree of satisfaction of past trainees' superior

- No statistical information was obtained.

12 Base information related to the PDM Indicators

12-1 Base information related to the Overall Goals

Table 26: Base information related to the Overall Goals

Indicator	Base information
1 EWTI continues to conduct training courses based on the guidelines and manuals on operational procedures for training introduced by the Project	▪ EWTI basically follows the same training implementation procedure as that of EWTEC period. ▪ There are no guidelines and manuals on operational procedures for training.
2 EWTI continues to conduct short-term training courses to trainees based on the developed manuals on training teaching and learning materials.	▪ EWTI does not have its own guidelines and manuals for teaching material preparation but preparation of guidelines on training operation and management has started by the initiative of EWTI. ▪ There is a manual on TTLM development prepared by Ministry of Education. TTLM has been introduced in all TVET colleges in the country and EWTI has intention to use the TTLM format for its short-term training courses (not yet realized).
3 EWTI conducts capacity development for EWTI's trainers through internal training	▪ There are a few occasions of training for EWTI staff but not on planned basis.

12-2 Base information related to the Project Purpose

Table 27 Base information related to the Project Purpose

Indicator	Base information
1 Guidelines and manuals on operational procedures for training are approved and shared in EWTI through workshop	▪ There are no guidelines and manuals on training operational procedures. ▪ There is no standard procedure for training operation.
2 More than 80% of trainees who attend pilot training courses respond that they are satisfied with the contents of the pilot training courses	▪ Pilot training is not yet conducted and satisfaction rate cannot be measured. ▪ The participants of current EWTI regular training courses in the past two years generally show high satisfaction according to the evaluation sheets submitted after completion of each training course.
3 The internal training plan for following year and internal training report are approved.	▪ There is no integrated plan for internal training based on the needs.

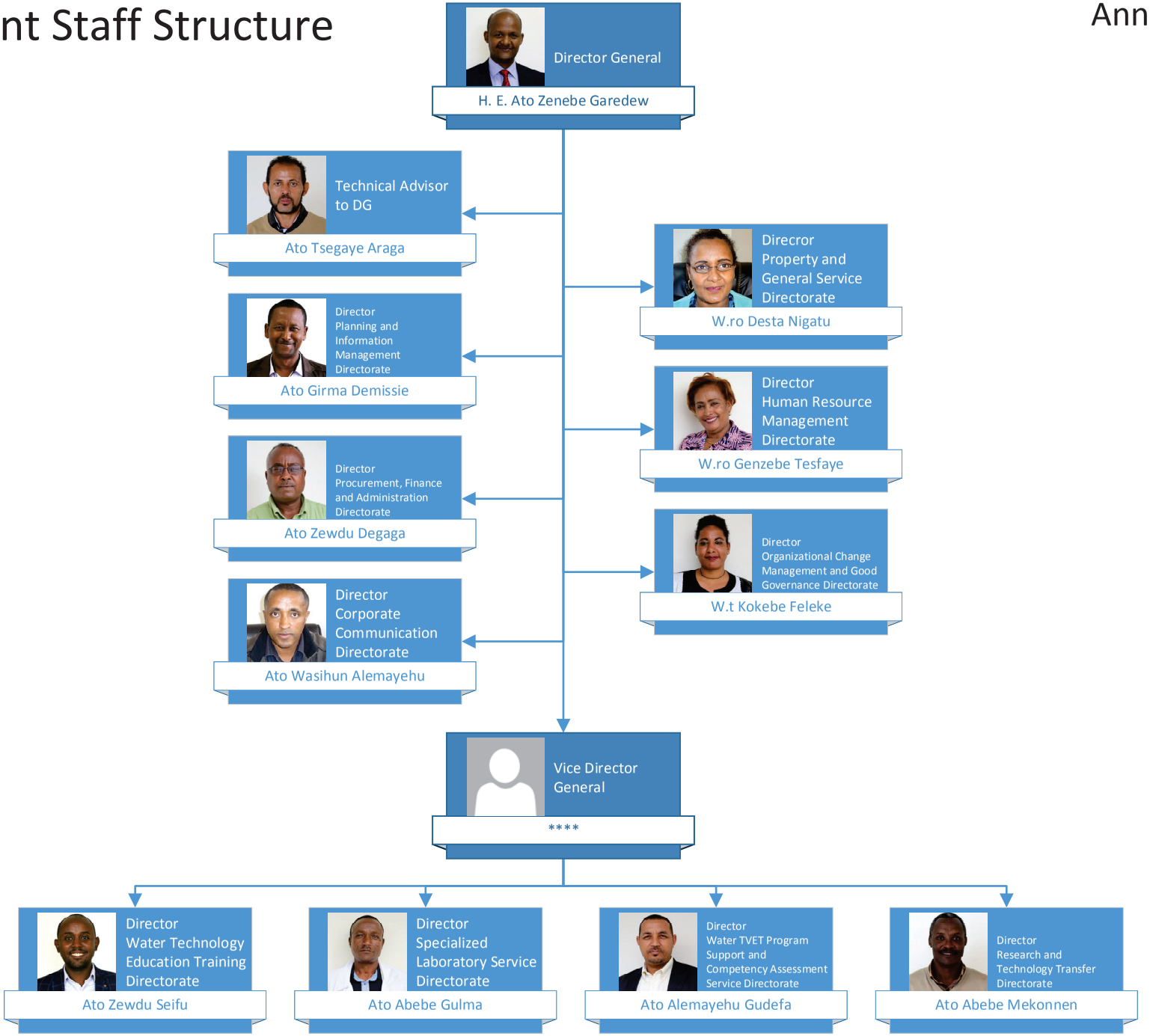
12-3 Base information for Outputs

Table 28: Base information for Project Outputs

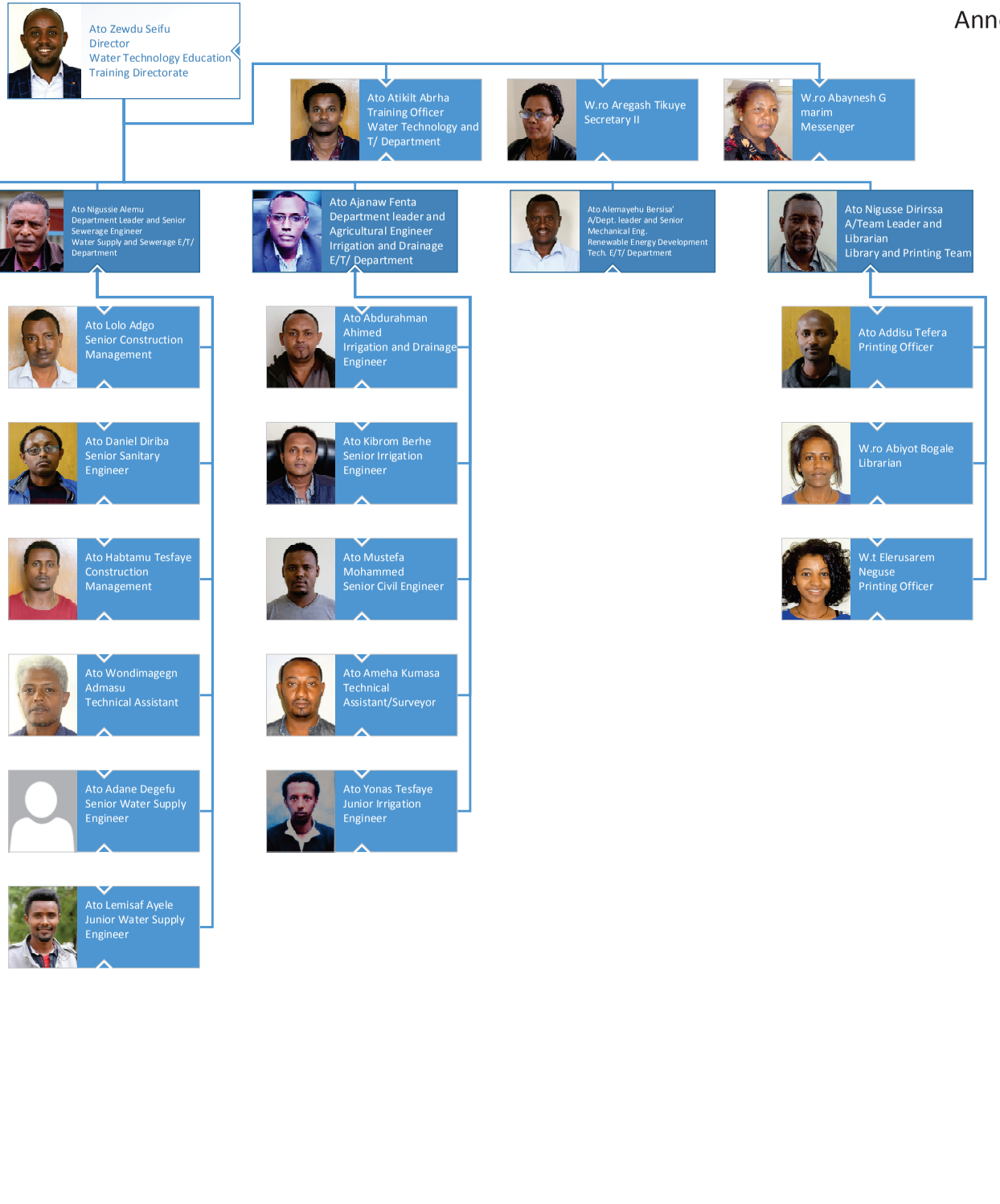
Indicator	Base information
1-1 Annual training plans developed by the project are approved by EWTI	▪ Annual training plans are developed based on the 5-year strategic plan. ▪ No reflection of TNA and TGS in the training plan. ▪ Training evaluation results are not systematically reflected into annual training plans.
1-2 The guidelines and manuals on operational procedures for training version 1 is revised to version 2	▪ Currently there is no written standard procedure for training operation but guidelines on training operation and management is under preparation. ▪ Due to lack of guidelines and manuals, the following problems are observed. - Overlapping of training courses which causes shortage of accommodation - Delay of notification (invitation) of training courses - No complete training report (without evaluation)
2-1 The developed manuals on training, teaching and learning materials are officially approved.	▪ Generally, the format prepared during EWTEC period is used for training modules but it is not officially standardized. ▪ No standard set of training materials. ▪ There is an effort to re-format the existing training modules by EWTI introducing the TVET standard. ▪ There is a manual on TTLM development prepared by Ministry of Education. TTLM has been introduced in all TVET colleges in the country and EWTI has intention to use the TTLM format for its short-term training courses (not yet realized).
2-2 Lecturers in charge of pilot training courses attains the level of targeted capacity in capacity development plan	▪ Majority of trainers for all technical fields are in need of improvement in practical skills. ▪ Results of self-evaluation indicate relatively lower competency in Research & analysis and Training delivery.
3-1 Internal training materials and internal training plan are prepared and approved	▪ Although there are some training courses provided for EWTI trainers, there is no integrated plan of internal training within ETWI.
3-2 More than 80% of participants, who attend the internal training courses, after a series of the training courses, are satisfied with the contents of the internal training courses	▪ There is no evaluation conducted and there is no document for the internal training.

Management Staff Structure

Annex 1 (1)



Structure of Water Technology Education Training Directorate



Water Technology Education & Training Directorate - Director

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
1	Zewdu Seifu Assefa	Diploma	Geography	Teacher	1996/1/11	20/1/2001	4	2	21	Certificate on training of Shift Leader & Tender Committee	
		BA degree	Civic & Ethical Education	Temporary Deputy Principal	21/1/2001	30/07/2001	0	6	10	Certificate on Preparation of Model Examination for Civic & Ethical education section on 15/9/1999	
				Deputy Principal	2001/1/8	15/3/2002	0	7	14		
		BA degree	Geography & Environmental Studies	Teacher	16/3/2002	30/10/2003	1	7	14	Certificate on Teachers's development, education improvement, civic and ethics training from 2/8/2001-4/8/2001	
		MA degree	Water Resource Planning & Management	Kirkos Sub-City Woreda 8 Administration Manager	2003/1/11	2005/9/3	1	5	0	Certificate on government policy, strategy and management skill training from 2/12/2003-15/12/2003	
				Water Permit Licensing Officer VIII	2005/10/3	30/10/2006	1	7	20	Certificate on Democracy, democratic unity, EFDR's rural development strategy, education & capacity building startegy and policies and teacher's role in education and training from 28/05/1998-11/06/1998	
				Registrar	2006/1/11	30/4/2008	1	6	0	BPR & BSC training certificate from 05/09/2007-12/09/2007	
				Water Technology Education & Training Directorate Director	2008/1/5	30/10/2009	1	6	0		
						Total (service time)	**13**	**0**	**19**		

Water Technology Education & Training Directorate - Water Resource Development & Drilling Technology

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
4	Tamiru Fekadu	BSC degree (1/4/84)	Geology	Mineral Exploration Expert	29/5/84	30/3/90	5	5	1	Computer	
		Msc degree	Resource & Environmental Engineering	Minining Geology	1990/1/4	30/6/1992	2	3	0	Management of Water Resources (Aug 15-Nov 1, 2001)	
				Geo-scientist II	1992/11/7	1993/8/8	1	0	27	Groundwater modeling 1/1/1996-16/02/1996	
				Groundwater Investigation & Development Course Coordinator	1993/9/8	30/10/1993	0	2	21	Geographic information system 07/07/96 to 28/07/96	
				Groundwater Investigation & Development Course Instructor	1993/1/11	30/11/1994	1	1	0	Groundwater Field Methods & Field Form Jan 24-28/2005	
				Groundwater Investigation & Development Course Coordinator	1994/1/12	30/6/1996	1	7	0	GIS for Groundwater management (from Feb 8, 2010-Feb 25, 2010)	
				Hydrogeologist IV	1996/1/7	30/11/1998	2	5	0	BPR & BSC 05/09/2007-12/09/2007	
				Geo-scientist VII	1998/1/12	15/02/99	0	2	16		
				Abroad on Education	16/2/1999	17/7/01	2	5	2		
				Geo-Scientist VII	18/07/01	30/01/02	0	6	12		
				Grounnatordwater Modelling, Remote Sensing & GIS Course Coordi	2002/1/2	30/09/2006	4	8	0		
				Groundwater Development, Study & Management Technology Directorate Director	2006/1/10	30/03/2008	1	6	0		
				Team Leader	2008/1/7	30/10/2009	1	4	0		
						Total (service time)	24	8	19		

Water Technology Education & Training Directorate - Water Resource Development & Drilling Technology

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
3	Mekonnen Aweke Enguaneh	Junior Diploma	Water Well Drilling Construction	Drilling Assistant	1977/12/3	30/2/1983	5	11	9	Certificate of Drilling Technology from 17/8/93 to 12/11/1993	
				Assistant Technician	1983/1/3	30/10/1986	3	8	0	Well Dignosis & Rehabilitation from March 21 to April 1, 2011	
				Driller	1986/1/11	1991/7/10	4	11	7	Certificate on Electro-Mechanical Maintenance from Feb 4 to 22, 2013 in Japan	
				Driller	1991/8/10	1996/6/3	4	5	0	Certificate on maintenance and repair of construction machinery covering servie workshop equipment and management, hydraulic components repair & testing, mobile workshop for field service from Feb 18 to 21, 2013 in Japan	
				Driller	1996/7/3	30/7/1996	0	4	24	Certificate in Well Rehabilitation from 12/7/2003 to 23/7/2003	
				Auto-Mechanic III	1996/1/8	18/9/1996	0	1	18	Certificate in Hydraulic Diesel Generator & Workshop Management from 13/9/2004 to 24/9/2004	
				Chief Driller	19/9/1996	30/10/2009	12	10	11		
						Total (service time)	**32**	**10**	**9**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
6	Dereje Fekade Abortugn	Bsc degree	Earth Science	Geologist	2003/1/2	30/4/2004	1	3	0	Certificate on practical training on Groundwatwr & Drilling works from Nov 22 to Dec 7, 2010	
				Drinking Water Works Support & Capacity Building Junior Expert	2004/1/5	30/10/2006	2	6	0	BPR & BSC training from 05/09/2007 -12/09/2007	
				Drilling Technologist	2006/1/11	30/6/2008	1	8	0		
				Geologist VI	2008/1/7	30/10/2009	1	4	0		
						Total (service time)	**6**	**9**	**0**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
12	Buzuneh Demisse H/Giorgis	Msc degree	Drilling of Oil	Mineral Control Service Expert	1989/1/4	1997/2/10	8	6	1	Planning Competency Assessment, Conducting Competency Assessment 17/06/2017 G.C.-19/06/2017 G.C.	
		Diploma	Law	Drilling Technology Instructor	27/11/2002	20/1/2003	0	2	3	Groundwater Investigation & Dev't from 8/8/1995-10/8/1995	
				Dalluti Marble Quarry Manager	2005/1/6	30/8/2007	2	3	0	Project Planning & Management, Primavera & Ms Project Software Utilization & Contract Administration 15/5/2009-29/5/2009	
				Drilling Instructor	2007/1/9	18/7/2008	0	10	17	Fundamental & Advance GIS, Remote Sensing & Digital Processing 15/6/2009-8/7/2009	
				Senior Lead Drilling Technologist	2008/1/8	30/6/2008	0	11	0	Study & Research Methods 4/1/2009-8/1/2009	
				Senior Drilling Technologist	2008/1/7	30/10/2009	1	9	0	BPR & BSC 5/9/2007-12/2007	
						Total (service time)	**14**	**7**	**21**		

Water Technology Education & Training Directorate - Water Resource Development & Drilling Technology

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
17	Mengesha Sisay	Bsc Degree	Physics	Teacher	1996/1/1	30/3/2002	6	3	0	Physics Education Refresh & Service	
		Msc Degree	Geo-Physics	Geo-Physicist	2002/1/4	30/2/2004	1	11	0	Geo-Physical Service Study	
				Junior Geo-Physicist	2004/1/3	30/2/2008	4	0	0	Vocation & Council	
				Senior Geo-Physicist	2008/1/3	30/10/2009	1	8	0	Teachers' Development	
						Total (service time)	**13**	**10**	**0**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
19	Zemenu Addis	Bsc Degree	Soil & Water Conservation	Soil & Water Conservation Officer	27/7/1993	30/5/2001	7	10	4	Computer Training	
		Msc Degree	Water Resource Engineering/ Hydrology	Safety Net Officer/Basin/	6/1/2009 G.C.	31/8/2011 G.C	2	7	25	SWAT Software	
				Project Manager (Irrigation)	1/9/2011 G.C.	31/7/2014 G.C	2	11	0	Basin Development 24/11/2008-7/12/2008 G.C.	
				Road Project Manager	1/9/2014 G.C.	31/1/2016 G.C	1	6	0	Monitoring & Evaluation 18/07/2005-22/07/2005 G.C.	
				Senior Hydrologist	2009/1/3	30/10/2009	0	8	0	Climate Change 5/6/2013-12/6/2013 G.C.	
						Total (service time)	15	6	29		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
18	Desalegn Gezahe	Bsc Degree	Geology	Junior Geologist	2009/1/8	30/10/2009	0	3	0		
						Total (service time)	0	3	0		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
14	Gizachew Getahun	Bsc Degree	Mechanical Engineering	Construction Equipment Supervisor	2007/8/11	2008/11/7	0	8	3	Computer Aid Engineering (CAE) software training 10/05/2015-17/05/2015 G.C.	
				Junior Drilling Workshop Intendant II	14/8/2008	30/10/2009	1	3	16	Drilling Technology 18/11/2008-3/13/2008	
										Trainer's methodology Training 16/2/2009-26/2/2009	
										BSC 11/9/2009-13/9/2009	
						Total (service time)	**1**	**11**	**19**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
11	Samuel Zewdu	Diploma	Geography	Teacher	1996/5/1	30/10/2000	4	9	25		
		Bsc Degree		Teacher /social science dept head	19/1/2001	25/5/2002	1	4	6		
				Teacher	24/6/2002	30/10/2006	4	4	7		
				Fund Securing & Project Preparation Senior Officer	2006/1/11	2009/3/2	2	3	3		
				Senior GIS & Remote Sensing Technologist	19/3/2009	30/10/2009	0	7	11		
						Total (service time)	**13**	**1**	**25**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
7	Beniam Dereje	Advanced Dip	Electro-Mechanical Technician	Kebele Manager	2000/7/2	15/6/2004	4	4	8	Drilling Technology 13/3/2008-17/5/2008	
				Maintenace Officer	2006/12/2	19/01/2008	1	11	7	DMMT 6/6/2009-29/7/2009	
		Certificate	EMMT	Assistant Driller	20/01/2008	30/10/2009	1	9	10		
						Total (service time)	**8**	**0**	**25**		

Water Technology Education & Training Directorate - Electromechanical & Drilling Machinery Maintenance Technology

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
8	Endalemahu Endale	Diploma	Electricity	Electrician	22/2/1997	20/2/2000	2	11	28	Industrial Refrigeration System Operation & maintenance (May 23-June 3, 20111	
		Bsc degree	Electrical/Electronics Technology	Senior Electrician	21/2/2000	2000/8/8	0	5	17		
				Junior Electrician	18/8/2000	22/3/2002	1	7	4		
				Electrician	23/3/2002	2007/3/1	4	9	10		
				Lead Electrical Maintenance Expert	2007/7/1	2008/11/2	1	1	4		
				Senior Ellectrical Engineer	2008/12/1	30/10/2009	1	9	18		
						Total (service time)	**12**	**9**	**21**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
9	Alemwork Gudu	Bsc degree	Electrical Engineering	Solar & Wind Energy Source Junior Training Expert	17/12/2002	30/10/2006	3	10	14	Advanced computer maintenance & networking	
				Electrical Engginer II	2006/1/11	30/6/2008	1	8	0		
				Senioir Electrical Engineer	2008/1/7	30/10/2009	1	4	0		
						Total (service time)	**6**	**10**	**14**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
10	Alemayehu Bersisa Wolde	Diploma	General Mechanic	Senior General Metal Worker	6/10/1991 G.C.	9/22/1999 G.C.	7	10	6	Mig/Mag welding from 15/10/2001-26/10/2001	
		10+3	Concrte Worker Technician	Chief Welder	1992/2/1	1993/2/1	1	0	0	Bamboo Charcoal Production Technology & Use Nov 1-27, 2010 G.C.	
		Graduate level V	Mechanical Technology	Welder & Cash Safe Worker	21/5/1993	28/5/1995	2	4	7	Rocket Stove Production Training from 25/05/2001-29/05/2001	
		Bsc Degree	Mechaanical Engineering 6th	Metal Shop Foreman	1996/1/4	30/2/1998	1	11	0	from April 20-May 7, 2009 G.C.	
				General Mechanic	1998/1/4	2001/8/3	2	11	8	From Feb 1-24, 2012 G.C.	
				Senior Metal Works Technician	2001/9/3	30/10/2006	5	7	21	From June 11-15, 2012	
				Senior Solar & Wind Technician	2006/1/11	30/3/2008	1	5	0	From Nov 10-21, 2013	
				Renewable Energy Dev't Edu. & Train. Technical Assistant II	2008/1/7	30/12/2008	0	6	0		
				Senior Mechanical Engineer	2009/1/1	30/10/2009	0	10	0		
						Total (service time)	**24**	**5**	**12**		

Water Technology Education & Training Directorate - Electromechanical & Drilling Machinery Maintenance Technology

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
15	Melaku Behailu	Msc	Mechanical Engineering	Chief of Technic Section	1981/2/10	1982/7/4	0	6	6	Maintenance management from 11/1/90-30/1/90	
				Equipment Erection Engineer	1982/10/4	13/04/1985	3	0	4		
		Diploma	Electronics	Occupational Safty & Health Officer, Design & Methods Engineer, & Mechanical Maintenance Section Chief	14/4/1985	1995/4/10	10	5	20	Radio Electronics (1986-1989)	
		Certificate	Electricity	Technology Expansion Division Manager	21/8/1995	18/01/1996	0	4	26	Power Engineering & Management (S.Korea) 3/4/2011-23/4/2011	
				Production & Production Equipment Service Dept Head, Provisional General Manager	15/8/1996	26/5/1997	0	9	12	Solar Energy Application & Management (China 28 days)	
				Qualiy Control Service Head, Science Equipment's Production Workshop Section Head	16/11/1997	27/1/2003	5	3	13	Wind Turbine Technology (India 1/2/2012-24/2/2012 G.C.)	
				Alternate Energy Support & Follow-up and Electro-Mechanical Engineer	28/1/2003	2007/3/7	4	5	6	Rural Electrification (China, 9/5/2015 to 8/6/2015 G.C.)	
				Senior Mechanical Engineer	14/8/2008	30/10/2009	1	2	16	Solar Energy Application & Management (12/05/2015 to June 2015 G.C.)	
						Total (service time)	**26**	**1**	**13**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
16	Gutema Terfasa	Bsc Degree	Electrical	Electrical Engineer II	20/12/2007	30/10/2009	1	10	10	EMMT 5/7/2008-27/7/2008	
										Planning & Report Writing 27/12/2008-29/12/2008	
						Total (service time)	**1**	**10**	**10**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
2	Merima Said Ismael	Junior Diploma	Metal Works	Machinist	1980/12/1	30/5/1992	12	4	18	Customer service delivery training for 18 hours	
				Assistant Machinist	1993/1/1	30/8/1993	0	8	0		
				Machinist III	1993/1/9	30/5/2002	8	9	0		
				Leave without salary	2002/1/6	2002/9/10	0	4	9		
				Machinist III	2002/10/10	30/9/2006	2	11	20		
				Senior Technician I Machinist	2006/1/10	30/06/2008	1	8	20		
				Technical Assistant	2008/1/7	30/10/2009	1	4	0		
						Total (service time)	**28**	**4**	**7**		

Water Technology Education & Training Directorate - Electromechanical & Drilling Machinery Maintenance Technology

It.No	Name	Education level	Profession	Work Experience (Ethio calendar) Job Position	From	To	Total Duration Year	Month	Day	Short-term training	Personal file/Discipline
5	Woinshet Damtew Worku	Diploma (12+2)	General Mechanic	Grade I Machinist	1982/1/3	30/1/1988	5	11	13	Operation & Maintenance from 30/8/1992 - 19/9/1992	
				Operation & Maintenance of water pump, spring dev't & maintenance	16/4/1991	30/9/1995	4	5	14	Community Action Plan frm 09/04/1994 - 18/04/1994	
				Operation & Maintenance	1995/1/10	19/4/1998	2	6	19	(with UNICEF financial support) Rural water supply administration from 06/09/1991-08/09/1991	
				Operation & maintenance expert	20/4/1998	30/10/1999	1	6	10	Project Preparation by Practice	
				Auto-Mechanic III	1999/1/11	30/9/2006	6	11	0	Strategic Planning & Management from 2/8/1995 -	
				Technician-Mechanic	2006/1/10	30/7/2008	1	9	0	ToT training from 09/04/1994-18/04/1994	
				Technical Assistant	2008/1/7	30/10/2009	1	4	0	Certificate on Electro-Mechanical Maintenance from Feb 4 to 22, 2013 in Japan	
										Certificate on servcie workshop equipment & management, hydraulic componenets repair & testing & mobile workshop for field servcie	
										Certificate on hydraulic diesel generator & workshop management from 13/09/2004-24/09/2004	
										Certificate on well rehabilitation course from 24/07/2004 - 4/08/2004	
						Total (service time)	24	5	26		

Water Technology Education & Training Directorate - Water Supply and Sewerage

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
30	Hailemichael Agdew	MSc	Water Supply and Sewerage	Hydraulic Engineer	1983/10/4	13/8/95	12	5	4	Ground Water Management (April 12-16/2013	
				Water Supply Supprt & Cap. Bu.Aff.Expert (Engineering)	22/9/97	30/6/2003	5	10	9	SPA 2009 (40 hours)	
				Water Supply Supprt & Cap. Bu.Aff.Expert (Engineering)	2003/1/7	30/8/2003	0	2	0	WaterCAD	
				Water Supply Supprt & Cap. Bu.Aff.Expert (Engineering)	2003/1/9	30/9/2006	3	1	0	Groundwater Modeling Course (28/12/2004-16/01/2005)	
				Water Supply & Sanitation Engineering Technology Directorate	2006/1/10	30/4/2008	0	7	0	Solar Energy Technology & Energy Efficiency (20/11/2011-1/12/2011)	
				Water Supply & Sewerage Technology Department Team	1/5/08	30/10/2009	1	0	0	Project Appresial (2 week)	
										Procurement & Contract Administration (30/8/1998-	
										Advance Professional Training in Environmental ManagementCost Minimizing in Industry (09/11/2001-30/10/2002)	
										Development & Management Course (Sept. 1, 99-Nov. 4,99)	
										Water Resources Development and Management	
										Introduction to modern, personal mgt., decision making motivation & cinnybucatuib, Team building and teams management, Authority deligation and decentrilization, leadership, change mgt. and management information systems (May 24-June 7/1999)	
										Computer Training (Dec. 15/98-April 02, 1908)	
										Water Resources Planning, Development and Management(Sept.1-Nov 24, 1999)	
						Total	23	7	13		

Water Technology Education & Training Directorate - Water Supply and Sewerage

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
24	Habtamu Tesfaye	BSc (July 16/2006)	Land Resource Management and Environmental Protection (Soil and Water Conservation)	Agricultural Supervisor	1999/1/3	30/4/2001	2	2	0	Basic Computer & Internet Training	
		BSc (July 28/2012)	Construction Technology and Management	Environment Protection Process Coordinator	2001/1/5	30/1/2002	0	9	0	Microsoft Office Project from 24/6/2004-4/7/2004	
				Data Collector	2002/1/2	30/12/2003	0	11	0	ETABS Software for 2 months	
				Quantity Surveyor	2004/1/1	30/6/2005	1	6	0	BSC	
				Regional Office Engineer	2005/1/7	30/12/2005	0	6	0	Project Planning Ms Software & Primavera Software Construction Mgt	
				Project Manager	2006/1/1	30/1/2008	2	0	3	Assesor Methodology 20-24/10/2009	
				Bid & Cost	2008/5/1	30/4/2008	0	3	25		
				Engineering Section Chief	22/4/2008	2008/8/10	0	5	8		
				Construction Mgt Expert	2009/1/3	30/10/2009	0	8	0		
						Total	9	3	6		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
25	Adane Degefu	M.Sc ዲግሪ	Management of Water Resources, Soil & Food Conservation (17/11/2015)	Production Supervisor	1999/5/1	29/2/2003	4	1	24	Fundemental and Advanced GIS,Remore sensing and olgital Image processing Feb22/2017-Apr17/2017	
				A/bagging floor Coordinator	30/2/2003	30/4/2004	1	2	0	Development & Implementarion of Qms based on ISO 7-11 feb 2011	
				Alternate Energy Technology Promotion Expert	2004/1/5	17/1/2008	3	8	16	Process optimzation and Loss control 6/1/2002-14/1/2002	
				Abroad on Education	18/1/2008	2009/7/3	1	1	19	PV system installation & maintanance 11/10/04-	
				Senior Water Resource Engineer	2009/8/3	30/10/2009	0	7	23	International Traing Programe on solar Energy Technologies & Application July 1st -July 19 th,2013 G.C.	
										Energy Efficiency Aug 27-31/2007	
										Balanced Score Card BSC 23/3/2009-25/3/2009e.c	
										Assessor's Methodology 20-24/10/2009	
						Total	10	9	22		

Water Technology Education & Training Directorate - Water Supply and Sewerage

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
26	Tefera Berhanu	BSc	Irrigation and Water Resource Engineering	Site engineer	25/11/2002	21/7/2004	2	6	16	HBV Hydrologcal Model Nev.17-26/2015	
		MSc	Civil Engineering	Junior Expert	2003/8/8	15/5/2005	1	9	8	GIS & Remote sensing feb.22-April 17.2017	
				Hydraulic Engineer	2005/3/6	2016/8/3	3	0	0	Auto CAD 40 Hours	
				Senior Hydraulic Engineer	2009/1/3	30/10/2009	0	8	0		
						Total	7	11	24		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
27	Lolo Adgo	Bsc Degree	Town Planning	Teacher	1978/1/1	30/07/94	15	7	0	Computer Training (16/11/95-16/02/96)	
		Bsc Degree	Civil Engineering	Town Planning Implementation & Land Administration Chief	1994/1/7	1995/7/7	0	11	7	Project Planning, Implementation , Montoring & Evaluation (13/04/2007-24/04/2007)	
		Higher Diploma	Town Engineering (Architect)	Technical Estimate Team Leader	1995/8/7	30/05/96	0	10	22	SPA2000 V 14 (October 6-November 14, 2009)	
				Technic & Land Administration Dept Head	1996/1/6	30/04/97	0	11	0	Urban land information Management system (GIS).	
				Architect	1/5/97	30/08/99	2	4	0	Trainer's methodology Training For EWTI Trainers	
				Town Planner	1/9/99	30/10/99	0	2	0		
				Land Development Mgt Process	1/11/99	30/03/2005	5	5	0	Modern Architecture and town planning	
				Town Planner Officer	1/4/05	22/12/2007	2	8	22	Planning Report Writing	
				Construction Cost/Price Advisor	23/2/2008	22/06/2008	0	4	0		
				Senior Construction Management	23/2/2008	30/10/2009	1	8	8		
						Total (service time)	30	11	29		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
28	Lemisaf Ayele	Bsc Degree	Water Resource & Irrigation	Junior Water Supply Engineer II	21/6/2008	30/10/2009	1	4	10	Computer Training (Octoer 10- December 20/2014	
										WaterCAD (January 10,2014-Feburary 20/2014	
						Total (service time)	1	4	10		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
29	Wondimagegn Admasu H/Meskel	Bsc Degree	Hydraulic & Water Resource EngineerJune 28/2012	Drinking Water Supply Construction & Maintenance Team Leader	1999/1/1	20/1/05	5	0	20	SPA, MX-Road, AUTO CAD (April 10-//May 15, 2012)	
				Civil & Irrigation Section Supervisor	23/4/2005	30/5/2005	0	1	7	Primauera Project Planner P3 Software(05-10, Sept,	
		Diploma	Electro-mechanical technology	Senior Irrigation Engineer	2005/1/6	30/5/2007	2	0	0	Water Resource Development Tecgnician(December 28-February 14/2000)	
				Irrigation Construction & Maintenance Team Leadr	2007/1/6	2008/3/8	1	2	2	Water Resource Development (January 02-Feb. 22/2008	
				Water Supply & Sewerage TECh Ed & Tr Technical Assistant II	14/8/2008	30/10/2009	1	2	16	Modern Irrigation System Management (16 September-11 October 2013)	
						Total (service time)	9	6	15		

Water Technology Education & Training Directorate - Water Supply and Sewerage

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
33	Daniel Driba Megersa	MSc Degree	Water System Technology	Junior Civil Engineer	2003/11/11	22-Apr-09	5	6	20	Construction Management (Project Management Tools & Methods) July 15-August 16, 2008	
		Bsc Degree	Hydraulics Engineering	Generator Design Engineer II	2009/4/23	28-May-09	0	4	18	Construction Management (Construction Supervision & Contract Administration) November 30, 2008-January 18,2009	
				Assistant Project Manager	2009/5/1	24-Sep-10	0	8	28	Project Management (27/11/2001-9/12/2001)	
				Senior Sanitary Engineer	14/8/2008	30/10/2009	1	2	17	Procurement Training (13/06/1999-4/7/1999)	
						Total (service time)	8	10	23		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
23	Negussie Alemu	Diploma	Drafting	Senior Draftsman	1977/1/6	30/2/1983	5	9	0		
		Higher Diploma	Civil Engineering	Engineering 5	1983/1/3	30/10/1985	2	8	0	Numerical Models to Enhance Rainfall (July 7-Aug 6, 2008)	
		Bsc Degree	Civil Engineering	Engineer III	1985/1/11	30/4/1990	4	6	0	On Environmental impact assessment March 14-25,	
				Technician 5	1990/1/5	30/4/1994	4	0	0	Flow measurement by salt dilution method 4/9/1998-259/1998	
		Msc Degree	Irrigation Water Mgt	Assistant Engoneer	1994/1/5	30/7/96	2	3	0	Hydrological field Operations & data Processing January 27-Fe.18/1997	
				Hydraulic Technician 5	1996/1/8	30/8/02	6	3	0	Flood Risk Mapping Training Oct.19-22/2009	
				Hydraulic Data Compiler	2002/1/9	30/8/03	1	0	0	Flood Risk Mapping Training December 7-11/2010	
				Hydrologist VII	2003/1/9	19/11/2003	0	2	19		
				Abroad on Education	20/11/2003	2005/8/11	0	0	0		
				Hydrologist VII	2005/9/11	30/10//2006	0	11	22		
					2006/1/11	30/03/2008	1	8	0		
				Senior Sewerage Engineer	2008/1/7	30/10/2009	1	4	0		
						Total (service time)	30	7	11		

Water Technology Education & Training Directorate - Irrigation and Drainage

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
20	Ajenaw Fenta Getaneh	Bsc	Agricultural Engineering	Irrigation Works Expert	1984/2/6	22/11/1985	1	5	20	ToT from 20/10/1993-18/12/1993	
				Irrigation Works Land Preparation Junior Expert	23/11/1985	27/5/1989	3	6	4	Basic Computer Training	
				Vegetables & Fruts Farm A/Head	28/5/1989	29/3/90	0	10	1	AutoCAD for 2 months	
				Irrigation Works & Land Preparation Junior Expert	30/3/1990	30/9/1992	2	6	0	Proje t Feasibility Study	
				land & Irrigation Preparation Section Chief	1992/1/10	30/4/1994	1	7	0	BPR & BSC from 5/9/2007-12/9/2007	
				Teacher	1/5/11994	30/3/1995	0	11	0		
				Development & Revenue Generation Coordination A/Head	1995/1/4	30/2/1996	0	11	0		
				Plant /Forest Soil Division Head	1996/1/3	30/9/1999	3	7	0		
				Irrigation Engineer VI	1999/1/10	30/8/2002	2	11	0		
				Irrigation Works Support & Capacity Building Affairs Expert	2002/1/9	30/10/2006	4	2	0		
				Lead Irrigation Engineer	2006/1/11	30/10/2009	3	0	0		
						Total (service time)	**25**	**4**	**25**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
21	Kibrom Berhe	Bsc Degree	Land Resource Management & Environmental Protection under Soil & Water	Soil & Water Conservation Junior Officer	2001/1/4	29/2/2005	3	10	28	Outcome Based	
			36 Credit Hrs Msc Program	Soil & Water Conservation Junior Instructor	17/03/2005	2007/9/3	1	11	22	Assessor's methodology course (Nov 29-Dec 1, 2013 G.C.)	
				Senior Irrigation Engineer	2007/12/6	30/10/2009	2	4	18	Watershed development technical training (Nov 24- Dec 4, 2010 G.C.)	
										COC certificate	
						Total (service time)	**8**	**3**	**8**		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
31	Mustefa Mohammed	Bsc Degree	Civil Engineering	Site Engineer	2008/10/12	31/1/2010	2	2	20	Foundamental Engineering Course (2004/05-2007/08)	
				Civil Engineering	20/4/2011	15/1/2013	1	9	12		
				Civil Engineer I	29/1/2013	13/6/2013	0	4	15		
				Civil Engineering	20/4/2011	15/1/2013	1	9	14		
				Site Engineer	20/10/2009	25/10/2011	2	1	6		
				Construction Engineer	15/4/2005	2006/2/7	1	2	17		
				Senior Civil Engineer	14/8/2008	30/10/2009	1	2	17		
						Total (service time)	**10**	**2**	**8**		

Water Technology Education & Training Directorate - Administrative Staff

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
22	Aregash Tikuye	Diploma	Secretary & Office Mgt	Secretary	2000/1/2	30/10/2001	1	9	0		
				Messenger	2004/1/10	27/7/2005	0	9	27		
				Secretary & Office Administration	24/8/2005	30/2/2008	2	6	6		
				Secretary II	2008/1/3	30/10/2009	1	8	0		
						Total (service time)	6	9	3		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
34	Adissu Tefera	12th	Academic	Photo Copier (Binder)	1997/1/4	30/3/2001	4	0	0		
				Photo Copy Service Officer	26/6/2007	2008/9/9	1	2	13		
				Printing Worker	2008/12/8	30/10/2009	1	2	18		
						Total (service time)	6	5	1		

It.No	Name	Education level	Work Experience (Ethio calendar)				Total Duration			Short-term training	Personal file/Discipline
			Profession	Job Position	From	To	Year	Month	Day		
13	Atikilt Abrham	Bsc Degree	Geography & Environmental Studies	Teacher	2000/1/2	15/9/2008	7	8	13	Corruption Prevention Strategies from 3/3/2005-5/3/2005	
				Training Officer	14/8/2008	30/10/2009	1	2	16	Trainig for Teachers on government policies & strategies from 22/10/2001-6/11/2001	
										Remote sensing & digital processing 15/6/2009-8/7/2009	
										BSC 11/9/2009-13/9/2009	
						Total (service time)	8	10	29		

Annex 3 Job description of WTET Directorate staff

Directorate:- Water Technology Education & Training Directorate

Job Position:- Director, Water Technology Education & Training Directorate

Accountability:- Deputy Director General

Duties

1. Prepare annual work plan and budget of the directorate; submit and get approval of the same;
2. Prepare policies, procedures and guidelines; submit and get approval of the same;
3. Direct and coordinate education and training programs of the sector;
4. Propose problem solving study and research ideas that can be possible to be conducted;
5. Direct and coordinate the training needs assessment on regular and short-term trainings;
6. Direct and coordinate the preparation of curriculum and occupational standards;
7. Ensure the fulfillment of the necessary education and training aid materials;
8. Prepare the annual education & training program of the institute with the involvement of other concerned offices; prepare action plan and implement the same;
9. Establish and direct virtual team whenever necessary;
10. Monitor the quality of training and evaluation and make a report of the same;
11. In line with his/her profession, participate in providing training or education and conduct study and research;
12. Direct and control the performance of the documentation and library service activities;
13. Direct and control the printing of the learning inputs;
14. Ensure that appropriate support is given to those in need of further educational strengthening and special support;
15. Decide the promotion and performance level of the trainers;
16. Direct and coordinate the institute's training-concern relationship with other organizations operating in the sector;
17. Represent the directorate in the management meeting of the institute; notify the result of such meeting to the staff of the directorate when necessary;
18. Take action to make free the staff from "rent seeking" attitude and shape them to be the change implementer;
19. Submit periodical performance report to immediate supervisor.

Directorate: - Water Technology Education & Training Directorate

Job Position: - Water Resource Development & Drilling Technology Education & Training Department Head

Duties

1. Plan, organize, direct and control the department activities;
2. Provide training in line with his/her profession; perform study and research; perform technology selection, adoption, and transfer activities; Based on the request and contractual agreement with regional office/s (particularly from those region/s who need special support) , provide professional support as well as follow-up and monitoring of groundwater investigation & modeling works, water well drilling and rehabilitation works;
3. Coordinate and direct the curriculum and occupational standard development activities;

4. Coordinate and direct the national TNA survey that focus on the practical training demand of regular and short-term courses of groundwater investigation & development and drilling technology;
5. Ensure the fulfillment of the necessary training & education aid materials; if not fulfilled, take action for their fulfillment in consultation with the immediate supervisor;
6. Propose ideas for policy and regulation matters;
7. Prepare action plan of manpower and logistics utilization for coordinated execution of the long-term and short-term trainings as well as for water well drilling and rehabilitation works; and perform follow-up and control for implementation of the plan;
8. Monitor the quality of the trainings and the training evaluation carried out in the department and report the same;
9. Ensure that appropriate support is given to those in need of further educational strengthening and special support;
10. Prepare performance measurement and evaluation plan for the staff of the department and implement the same;
11. Perform daily monitoring of each staff performance of the department and resolve problems that may be encountered;
12. Perform evaluation of the department's staff performance and make decision;
13. Prepare capacity building strategy of the department; and up on approval, implement the same; and perform evaluation of the result jointly;
14. Prepare and submit work performance report to immediate supervisor;
15. Perform other related activities as instructed by the supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Senior Hydro-geologist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Senior Hydrologist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Senior Drilling Technologist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;

- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Senior Geo-Physicist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Senior Water Resource Development & Management Expert

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;

- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Senior GIS & Remote Sensing Technologist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Geologist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;

- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Junior Geologist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Drilling Superintendent II

Duties

1. In consultation with the Drilling Engineer, prepare annual work program for water well drilling machineries, necessary inputs of materials, and manpower and financial requirements; and up on approval, implement the same;
2. Before mobilization, check the drilling site area along the assigned Drilling Engineer to ensure the accessibility of the site and the nearby availability of necessary inputs for the drilling operation (water, fuel, medical service, etc.);
3. Make arrangement for simultaneous execution of the drilling works and practical training of the drilling technology; and provide practical trainings for trainees inside the institute's compound;
4. Receive and check the field requests and submit the same to the concerned work unit; perform follow-up for the processing of the request; and send the requested item to the field;
5. Give solution being present at the site where problem/s encountered;
6. Provide on the job training for drillers to orient and capacitate them with the new drilling technologies;
7. Perform survey of the drilling site in advance of mobilization and prepare accident prevention plan in order to protect the drilling team from potential accident;
8. For every project, prepare cost analysis report by recording expenses incurred for manpower, material inputs and equipment; submit report for evaluation to be done by immediate supervisor; inform drilling teams to take corrective action in case of performance deficiency so that such problems will not be repeated in the next project;
9. In order to tackle problems of the repeated breakdown of the drilling machines at the field, prepare information based on reports collected from chief drillers that will be used as inputs and participate in the preparation of annual preventive maintenance plan;
10. Prepare and submit work performance report to his/her supervisor;
11. Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Workshop Attendant

Duties

- Prepare and check the proper functionality of pumps and accessories, measurement instruments, generators, electrical instruments, sample water containers, etc. that are necessary for conduct of pump testing; and responsible to keep them in a safely manner;
- Up on the completion of drilling or rehabilitation work, perform pump testing by selecting the pump in accordance with the criteria given to him/her;
- Notify to immediate supervisor if problems encountered during the pump testing process;
- Make recording of the water discharge rate from the position of the water depth level and the water table situation at a different time;
- Up on completion of pump testing, seal the well; make report to the project head of drilling technologist; return all equipment issued for the project to the concerned office ;
- During pump testing, carefully collect and safely keep the water samples; submit the same to the project head to be sent for investigation in laboratory;
- Prepare and submit work performance report to his/her supervisor;

- Perform other related activities as instructed by his/her supervisor

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Chief Driller

Duties

- Responsible to perform the water well drilling and rehabilitation works in accordance with the training plan and the signed drilling contractual agreement;
- Prior to mobilization, make ready the necessary inputs for the field work such as equipment, vehicles, finance and required manpower, etc.;
- Perform minor preventive maintenance on the drilling rig at the field in order to keep the long service life of the machine;
- Control the drilling work to be carried out in accordance with the given design, depth level and other criteria; and also control the proper handling and safe keeping of sample rocks;
- Take care to avoid problem while performing drilling; if problem encountered, take immediately necessary remedial action; if the problem is beyond his/her capacity, he/she makes immediate report to Superintendent;
- Provide necessary training to trainee at the field by explain that the the drilling
- Organize and lead the team for proper execution of the technical and administrative tasks at the field;
- Notify additional input request to the Superintendent from the field; and follow-up the timely shipment of the requested inputs to the field site;
- Make daily record of the performed tasks in the drilling record book or ledger, and get signed the daily recording by the project head and submit report to immediate supervisor;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Driller

Duties

- In cooperation with the Chief Driller, involve in the preparation of plan for project field work; and perform tasks as per plan;
- As per given drilling work criteria, monitor the loading of the necessary inputs for the drilling field work with the prepared check list;
- In order to keep the operational well-being of the machine, check daily the moveable and fixed parts of the machine and take action to fulfill missing items or maintain broken or un-functional parts;
- Orient and train junior or assistant drillers of drilling technology with the purpose and use of each equipment so that the trainees understand and practice the same;

- In the absence of Chief Driller, he/she acts to perform the technical and administrative works during the drilling field work;
- Make demonstration to assistant drillers about proper collection of sample drilling rocks at interval of depth level and monitor their collection performance accordingly;
- Take necessary care while performing drilling work to prevent occurrence of problem; and provide assistance to Chief Driller on this matter;
- Before the start of drilling work, perform daily inspection of the rig machine's condition of water, oil, fuel, etc. as well as any unfulfilled inputs for the drilling work;
- Every day before the start of drilling work, take measurement of the depth level of the well and the volume of water inside the well, make recording of the measured items, and ensure that no problem to proceed with the drilling work;
- Make daily recording of the detail drilling works as well as the utilized inputs on daily drilling report recording;
- Receive, keep in safe and utilize properly all the materials and/or equipment that he/she received for drilling and training tasks; and return the remaining consumable items and equipment to the store unit;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Water Resource Development & Drilling Technology

Job Position: - Assistant Driller I

Duties

- During the preparation of mobilization, as per instruction given, perform loading and have loading of the necessary materials and equipment per category; and unload at the arrival of the field work site area;
- Participate in the works of drilling rig set-up at the drilling site area; and adjust the camping equipment and materials and perform tent erecting;
- While the drilling machines are at work, perform the refilling of oil, lubricants, water and fuel; and also perform tightening of loose nuts;
- During the drilling operation, pass the necessary drilling accessories to chief driller or driller, perform the mud stirring, and collect and keep safely the rock samples;
- Prepare ditch for drainage of discharge materials (cutting) and water from the drilling operation; and clean the ditch regularly;
- Participate as assistant to maintenance technicians or professionals during the servicing or maintenance of the drilling machines;
- Collect and load all properties after the completion of the drilling or rehabilitation work;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Job Position: - Electro-Mechanical & Drilling Machinery Maintenance Technology Education & Training Department Head

Duties

- Plan, organize, direct and control the department activities;
- Provide training in line with his/her profession; perform study and research; perform technology selection, adoption, and transfer activities; Based on the request and contractual agreement with regional office/s (particularly from those region/s who need special support) , perform tasks, provide professional support as well as follow-up and monitor the activities under the contract ;
- Coordinate and direct the curriculum and occupational standard development activities;
- Coordinate and direct the national TNA survey that focus the practical training demand on regular and short-term courses of electro-mechanical and drilling machinery maintenance technology;
- Propose ideas for policy and regulation matters;
- Prepare action plan of manpower and logistics utilization for coordinated execution of the long-term and short-term trainings as well as for advisory and support works; and perform follow-up and control for implementation of the plan;
- Monitor the quality of the trainings and the training evaluation carried out in the department and report the same;
- Ensure that appropriate support is given to those in need of capacitating education and special support;
- Prepare performance measurement and evaluation plan for the staff of the department and implement the same;
- Perform daily monitoring of each staff performance of the department and resolve problems that may be encountered;
- Prepare capacity building strategy of the department; and up on approval, implement the same; and perform evaluation of the result jointly;
- Prepare and submit work performance report to immediate supervisor;
- Perform other related activities as instructed by the supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Senior Mechanical Engineer

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;

- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Senior Electro- Mechanical Engineer

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Senior Electrical Engineer

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;

- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Senior Auto-Mechanic Technologist

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Electrical Engineer

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Mechanical Engineer

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Annex 3 Job description of WTET Directorate staff

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Junior Electrical Engineer

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Junior Mechanical Engineer

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;

- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Auto- Mechanics

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;
- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Directorate: - Water Technology Education & Training Directorate

Department: - Electro-Mechanical & Drilling Machinery Maintenance Technology

Job Position: - Junior Auto- Mechanics Technician

Duties

- In accordance with the institute's program, provide theoretical and practical training in line with his/her profession;
- In line with his/her profession, conduct problem solving study and research;
- Provide professional support and consulting service in accordance with the requests submitted to the institute;
- In cooperation with other concerned staff, involve in selection, adoption and transfer of problem solving technology;
- In line with his/her profession, participate in national training needs assessment of practical water technology courses; perform analysis on collected data and prepare a consolidated study report;
- In accordance with the result of conducted TNA, participate in the development of curriculum for training courses of newly designed or improved occupational standards;

- Coordinate and lead trainees during educational visit and practical exercises;
- Provide additional/capacitating education as special effort to enhance capacity of trainees and provide consultation service;
- Prepare and submit work performance report to his/her supervisor;
- Perform other related activities as instructed by his/her supervisor.

Project for Strengthening Capacity for Training Operation and Management for Ethiopian Water Technology Institute (EWTI)

End-line Survey Report

July 2024

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1. Budget Details
2. Results of Self-assessment in ID Competency
3. EWTI Organization Structure

Acronyms

Acronym	Description
BPR	Business Process Re-engineering
BSC	Balance Scorecard
COC	Certificate of Competency
C/P	Counterpart
DMMT	Drilling Machinery Maintenance Technology
DT	Drilling Technology
EM/DMMT	Electro-Mechanical and Drilling Machinery Maintenance Technology
EMI	Ethiopian Management Institute
EMMT	Electromechanical Machinery Maintenance Technology
ETTL	Education and Training Team Leader
EWTEC	Ethiopian Water Technology Centre
EWTI	Ethiopian Water Technology Institute
GI	Groundwater Investigation
GIS	Geographic Information System
GTP	Growth and Transformation Plan
HRM	Human Resource Management
ID	Instructional Design
JICA	Japan International Cooperation Agency
MoF	Ministry of Finance
MoPS&HRD	Ministry of Public Service and Human Resources Development
MoWE	Ministry of Water and Electricity
NGO	Non-Governmental Organization
OWNP	One WASH National Program
PDCA	Plan-Do-Check-Act
PDM	Project Design Matrix
R/D	Record of Discussions
TGS	Technical Gap Survey
TNA	Training Needs Assessment
TOT	Training of Trainers
TTLM	Training, Teaching, Learning Materials
TVET	Technical and Vocational Education and Training
TVETC	Technical and Vocational Education and Training College
WRD&DT	Water Resource Development and Drilling Technology
WSE	Water Supply Engineering
WTET	Water Technology Education and Training

1 Introduction

The Project for Strengthening Capacity for Training Operation and Management of Ethiopian Water Technology Institute (EWTI) is a technical cooperation project under a bilateral agreement between the Ministry of Water and Energy and Japan International Cooperation Agency (JICA), which was launched in June 2017. The Project was designed to be conducted for a three-year period, but for several reasons, such as the COVID-19 pandemic, it was extended to July 2024.

The Baseline Survey was conducted in the initial year of the Project and this End-line Survey was conducted to see the changes made due to the Project intervention and over the 7 years period.

1) Objectives of the end-line survey

The objectives of the end-line survey are mainly to study the changes in the subjects related to the project by comparing the information between the baseline and the end-line. Some organizational changes over the project period are also to be looked at.

2) Methodology

The methodology applied for collecting the information are the following;

- Interview
- Secondary data collection

The Project Team tried to obtain the information of EWTI by interviewing directors, team leaders and other key staff members involved in the Project.

3) Duration of data collection

The data collection for this end-line survey was carried out from September 2022 to July 2024. The duration was extended for the last two years, as the project extension was done several times from that time.

4) End-line matrix

The collected data for the end-line is summarized in the following end-line matrix which was made based on the baseline matrix. The contents of this report are based on the listed items in the table.

Table 1: End-line matrix

		Required Information for Endline Survey	Information Source	Method of information collection
1	Record of past training experiences			
1-1		Annual training plans for the project period	Annual training plans (2010-15), WTETD	Secondaty data collection
1-2		raining courses	Annual training plans (2010-15), WTETD	Secondaty data collection
		Changes in training subjects and reasons		Comparative analysis of secondary data
1-3		List of participants with personal details	Training record, Registrar	
2	Method of training needs analysis			
2-1		Changes in methods and process of training needs analysis in the project period	TNA, Technical Gap Survey, Zewdu, Alemayehu	Secondary data / interview
2-2		Changes in timing, frequency of needs analysis	TNA, Technical Gap Survey, Zewdu, Alemayehu	Secondary data / interview
2-3		Change in survey contents and results of needs analysis	TNA, Technical Gap Survey, Zewdu, Alemayehu	Secondary data / interview
2-4		Extent to which the analysis reflected to annual training plans	TNA, Technical Gap Survey, Zewdu, Alemayehu	Secondary data / interview
3	Annual training plans			
3-1		-1	Annual training plans (2010-15), WTETD	Secondaty data collection
3-3		Changes in method and process of planning	Guidelines, Alemayehu	Secondary data / interiew
3-4		of the Guidelines	Guidelines	Secondary data
3-5		guideing plans	5 or 10 year plans, new water policy, etc. , WTETD	Secondary data
3-6		Changes in understanding of superior plans	Alemayehu, selected trainers	Interview
4	Training budget			
4-1		Amount of budget and breakdown (2011-15)	Budget plan / report (2011-15), WTETD	Secondary data
4-2		f budget allocation	Interview, WTETD/Finance	Secondary data
4-3		s in budget implementaiton	Interview, WTETD/Finance	Secondary data
5	Existing training materials			
5-1		List of training materials, contents, lecture-practice ratio	TTLM, WTETD/Trainers	Secondary data
		Changes in training materials during the project period		
5-2		Changes in preparation and approval process of training materials	Guidelines, interview, WTETD	Secondary data, interview
5-3		ep	Interview, observation, WTETD, Library, Trainers	Secondary data, observation
5-6		t inventory, records	Inventory, records, observation, WTETD, General Service	Secondary data, Observation

No.		Required Information for Endline Survey	Information Source	Method of information collection
6	Trainers			
6-1		Number of trainers	Staff list, WTETD / HR	Secondary data
6-2		Educational background and working experience	Staff list, WTETD / HR	Secondary data
6-3		Capacity of trainers to deliver training	Capacyty assessment results, Trainers	Competency assessment
6-4		External trainers	Interview, WTETD/Trainers	Interview
7	Monitoring and evaluation system			
7-1		Method of trainees evaluation /training evaluation	Guidelines, Interview, WTETD/Trainers	Secondary data / Interview
7-2		Frequency	Guidelines, Interview, WTETD/Trainers	Secondary data / Interview
7-3		Results of evaluation Way to reflect the results	Interview, WTETD	Interview
7-4		How the data is kept	Interview, Observation, WTETD	Interview, Observation
		Changes in evaluation system and analysis	Interview, Observation, WTETD	Interview, Observation
8	Knowledge management			
8-1		Training document management	Interview, Observation, WTETD/Trainers, Library	Interview, Observation
9	PR			
9-1		Publication of newsletter (frequency, how to make, to whom distributed)	Interview, Observation, Cooperate Commuication D.	Interview, Observation
9-2		Website (who manages, frequency of update, visitor's number, level of staff capacity)	Observation	Observation
9-3		Process to decide PR contents	Interview, Cooperate Communication	Interview
9-4		Other information transmission (use of public mas media etc.)	Interview, Cooperate Communication	Interview
10	Human resource development and management of EWTI			
10-1		Job description of EWTI staff	Staff list and TOR, HR	Secondary data
10-2		Staff development plans (if present)	Related documents, interview, WTETD / HR	Secondary data, Observation
10-3		Method and process of staff evaluation	Interview, WTETD / HR	Interview
10-4		Frequency of staff training	Interview, WTETD / HR	Interview
10-5		Contents and method of staff training	Interview, WTETD / HR	Interview
11	Satisfaction of trainees			
11-1		Degree of satisfaction of trainees	Training evaluation Follow-up survey	Secondary data analysis Interview
11-2		Degree of satisfaction of trainees' superior	Follow-up survey	Intervies to superiors of ex-trainees

2 Record of past training experiences

2-1 Annual training achievement from 2017/18 to 2022/23

Table 2, Table 3 and Figure 1 show the evolution of the number of training courses delivered by EWTI and the number of trainees attending in EWTI training courses from 2014/15 (the first year of EWTI's operation after transformation from EWTEC[1]) to 2022/23. The total number of training courses and the number of trainees increase steadily during this period with the exception of the year 2019/2020 when the COVID 19 pandemic occurred (in particular, the number of the regular courses decreased in 2019/2020). However, EWTI started to accept the On-demand courses requested by other organizations such as international NGOs and UNICEF during this period, filling the gap of the decrease in the regular courses. Since then, the number of the On-demand courses has continued to increase and it has covered almost a third of EWTI's total number of training courses in 2022/2023.

It should be noted that this information is based on the database prepared by the Registrar's office with the support of the JICA project. However, there existed some training courses (mainly On-demand courses) that did not officially pass through the Registrar's office because the acceptance of these On-demand courses from other organizations was irregular cases at that time, so that there was no official record of trainees for these courses. As a result, there is a gap between the information in the database of the Registrar's office and that reported by EWTI management side. Since there is no information recorded for those unreported courses, the data recorded in the Registrar's office is used in the following analysis in this End line Survey Report.

Table 2: Number of training courses delivered at EWTI from 2014/15 to 2022/23

Training Type	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	Total
Regular	11	18	23	33	31	23	42	51	53	285
On-demand	0	0	0	0	1	12	10	20	28	71
Total	11	18	23	33	32	35	52	71	81	356

Table 3: Number of trainees participated in the training courses of EWTI from 2014/15 to 2022/23

Training Type	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	Total
Regular	201	365	424	471	447	313	591	613	927	4,352
On-demand	0	0	0	0	18	267	284	370	522	1,461
Total	201	365	424	471	465	580	875	983	1,449	5,813

[1] EWTI was established as an autonomous public institution in August 2023, but the actual training operation started the following year.

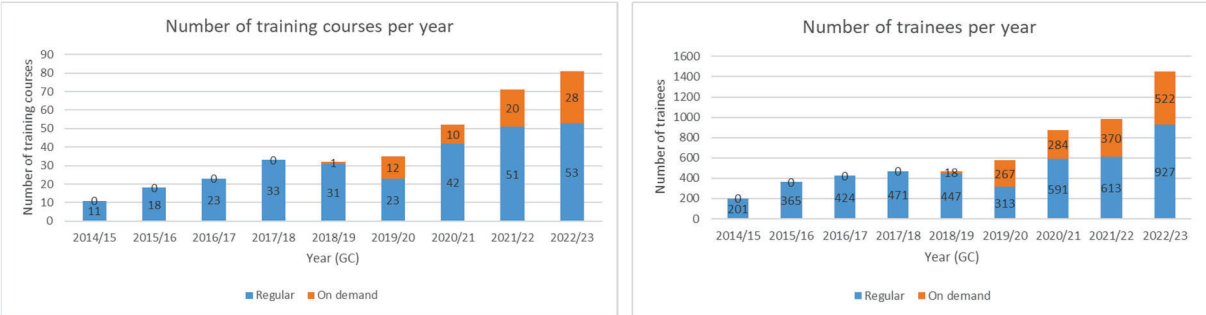


Figure 1: Evolution of number of training courses (left) and number of trainees (right) at EWTI from 2014/15 to 2022/23

2-2 Title of training courses

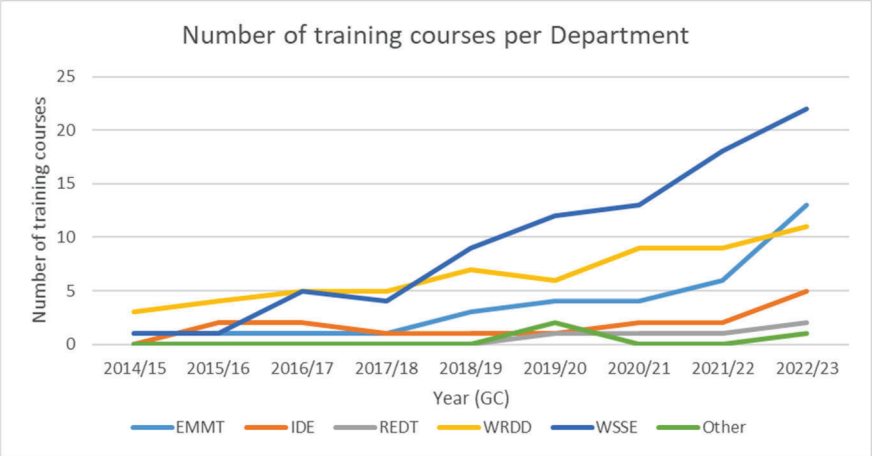
Table 4 shows the comparison between training courses delivered in 2017/2018 (at the time of the Baseline Survey) and 2022/2023. The table shows that the number of courses has more than tripled from 17 in 2017/2018 to 54 in 2022/2023. In addition, Figure 2 shows the change in the number of training courses provided by each department of EWTI from 2014/15 to 2022/23. It shows a drastic increase in the number of training courses delivered by the WSSE, WRDD and EMMT departments during this period, which are the major ones since the EWTEC period.

Table 4: Comparison between training courses delivered in 2018/2019 and 2022/2023

Year	No	Training Course Title	Responsible department*
2017/ 2018	1	Drilling Machinery Maintenance Technology (DMMT)	DEMMT
	2	Electro-Mechanical Maintenance Technology (EMMT)	
	3	EMMT for TVET Trainers & Trainees	
	4	Irrigation & Drainage	ID
	5	Surface Water Irrigation Study & Design	
	6	Drilling Technology (DT)	WRD&DT
	8	Groundwater Investigation (GI)	
	9	Well Rehabilitation	
	10	GIS & Remote Sensing	
	11	Water Supply Engineering (WSE)	WSE
	12	Contract Administration & Project Management	
	13	Sanitation & Solid Waste Management	
	14	Non-Revenue Water Management	
	15	Water Service Management	
	16	WSE for TVET Trainers & Trainees	
	17	Training for Meteorology Trainees	Other
2022/ 2023	1	Air Compressor Operation and Maintenance	EMMT
	2	Control Board Installation Operation and Maintenance	
	3	Electro Mechanical Maintenances Standard Maintenance Procedure	
	4	Electromechanical and Solar Operation and Maintenance, Water Resource Management, NRW and HDPE Pipe Welding	
	5	Electromechanical Machineries and Solar Water Pumping System Installation, O & M, CR-Water Safety Plan and PE-Welding Technique	
	6	Electromechanical Machineries Maintenance (Generator and Switch Board)	
	7	Electromechanical machineries Operation & Maintenance (Switch board & Pump)	
	8	Gen-set Operation and Maintenance	
	9	Operating a Generator	
	10	Operating Electromechanical Machineries	
	11	Operation and Maintenance of Electromechanical Machineries	
	12	Operation and Maintenance of Electromechanical Machinery and Solar Water Pumping	

Year	No	Training Course Title	Responsible department*
		System	
	13	Pump Operation and Maintenance	
	14	Diversion Weir and Canal Design and Layout (With Civil 3D and Arc GIS)	IDE
	15	GIS and CROP-Wat Software Application	
	16	Irrigation and Drainage System Operation Maintenance	
	17	Irrigation System Operation and Maintenance	
	18	Topographic Map Interpretation and Watershed Delineation	
	19	Solar Water pumping system Installation, Operation and Maintenance	REDT
	20	Solar Water Pumping System Standard Maintenance Procedure	
	21	Advanced Hydrology	WRDD
	22	Drilling Fluid Engineering	
	23	Drilling Technology	
	24	GIS and GPS Application Using Open-Source Software (Q GIS, KOBOTOOL BOX, ODK and Q FIELD)	
	25	GIS and GPS Applications Using Open-Source Software (WaSH and settlement)	
	26	GIS and Network Analysis	
	27	GIS and Remote Sensing	
	28	GIS for Water Resource Management	
	29	Groundwater Modeling	
	30	Water Well Diagnosis and Rehabilitation	
	31	Water Well Drilling Supervision	
	32	Auto CAD Software	WSSE
	33	Climate Resilient Water Safety Plan and Water Quality Monitoring and Surveillance	
	34	Construction Supervision and Contract Administration and Construction Claim and Dispute Management	
	35	Customer Service Management	
	36	MSE Business Management Training	
	37	Non-Revenue Water Management	
	38	Plumbing system and HDPE Pipe Welding Technique	
	39	Project Planning and Contract Administration With MS-Project and Primavera software	
	40	Urban Sanitation and Solid Waste Management	
	41	WASH Governance, Solid Waste Management, Integration of Climate Resilience into OWNP and Gender and Social Inclusion Using Count Mein	
	42	WASH System Strengthening	
	43	Water Board Operations, Customer forum, Customer Service and Satisfaction, Key Performance Indicators	
	44	Water GEMS and Auto CAD Software	
	45	Water GEMS and GIS Software Application Training	
	46	Water GEMS Software	
	47	Water Safety Planning, Water Quality testing and Monitoring	
	48	Water Supply Distribution System Maintenance Standard Maintenance Procedure	
	49	Water Supply Engineering (Water-GEMS, SAP 2000, and Water Treatment	
	50	Water Supply Engineering (Water-GEMS, SAP 2000, Water Treatment and GIS pipe Networking)	
	51	Water Supply Modelling (Water-GEMS, Auto-CAD, and Water Treatment)	
	52	Water-CAD software	
	53	Water-GEMS, GIS and Auto CAD Civil 3D	
	54	Training On Micro and Small Enterprise Job	Other

* WRD&DT: Water Resource Development and Drilling Technology Department, DEMMT: Drilling and Electromechanical Machinery Maintenance Technology Department, WSE: Water Supply Engineering Department, ID: Irrigation and Drainage Department, EMMT: Electromechanical Machinery Maintenance Technology, WSSE: Water Supply and Sewerage Engineering Technology, WRDD: Water Resources Development & Drilling Technology, IDE: Irrigation & Drainage Engineering, REDT: Renewable Energy Development Technology



Note: This graph shows simply the number of training course varieties. Therefore, even if the same training course is given more than twice in a year, it is counted as one course in that year.

Figure 2: Evolution of the number of training courses delivered by each Department at EWTI from 2014/15 to 2022/23

2-3 Source of funding for training courses

Table 5 shows the number of training courses according to the source of funding for the training courses from 2014/2015 to 2022/2023. In principle, EWTI's training courses have been funded from the government budget since the time of EWTEC, as the EWTI did not have a financial mechanism to receive outsourced funds. However, in response to the training needs of conducting training from donors such as international NGOs[2], UNICEF, TVETC etc., the EWTI started to utilize the external funds with the tacit approval of the MoWE from around 2018/1019. Figure 3 shows the comparison of the funding sources for EWTI training by the number of training courses between 2017/18 (at the time of the Baseline Survey) and 2022/23. It shows that in 2017/2018 all the training courses were covered by the government budget, whereas in 2022/23, 22% of all training courses were funded by external donors.

Table 5: Number of training courses according to the source of fund from 2014/2015 to 2022/2023

Organizations	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	Total
Government	11	18	23	33	31	17	42	51	63	289
JICA	0	0	0	0	0	6	0	0	0	6
Ministry	0	0	0	0	0	0	3	6	0	9
NGO	0	0	0	0	0	9	5	9	10	33
TVET	0	0	0	0	1	3	1	0	0	5
UNICEF	0	0	0	0	0	0	0	1	6	7
University	0	0	0	0	0	0	1	1	1	3
Other	0	0	0	0	0	0	0	3	1	4
Total	11	18	23	33	32	35	52	71	81	356

[2] International NGOs as external donors include Water Aid, Oxfam, and IRC.

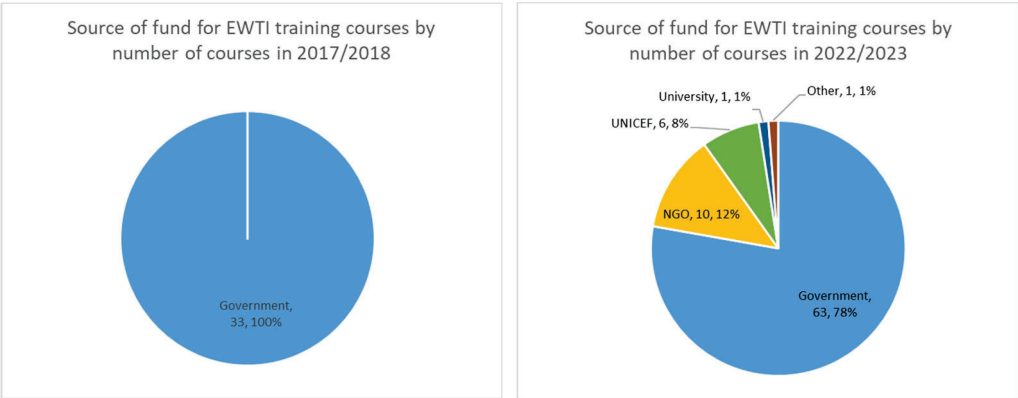


Figure 3: Comparison of funding source for EWTI training by the number of training courses between 2017/18 and 2022/23

2-4 List of participants with personal details for each course

The Registrar's office has been collecting trainee's information from trainees and summarizing in Excel format set out in the Guidelines for Training Operation and Management (Figure 4). The Excel data has been systematically stored in the Registrar's office computer each year after the format of the guidelines was introduced in the year 2018/19. The staff members of the Registrar's office and some members of the knowledge management team received training on how to accumulate the collected information into the EWTI database and how to analyze the data using Excel tools such as pivot tables. However, due to the lack of staff in the Registrar's office, the analysis has not been carried out on a regular basis. Therefore, the Project supported verification and analysis of the collected data and analyze them for the End line survey.

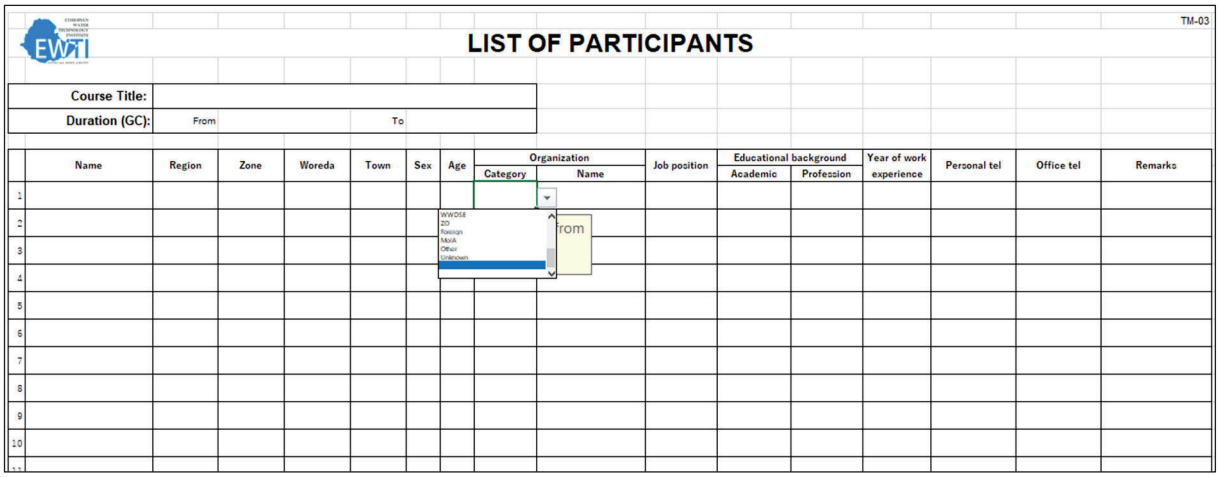


Figure 4: Template for list of participants in Excel format
(data validation criteria have been set for certain cells to avoid typing errors)

Table 6 and Figure 5 show the number of EWTI trainees and the percentage of organizations to which the trainees belong. According to this analysis, almost half of the EWTI trainees is occupied by those

from the Regional Water Bureau, the Town Water Supply Service and the TVETC. Until the year 2017/18 before the Project started, it shows a high number of "Unknown" because the detailed information on trainees was not fully collected and recorded, which make it difficult to simply compare the proportion of organizations between 2017/18 and 2022/23. However, the general trend of organizations that EWTI receives for training has not changed drastically during these years.

Table 6: Number of trainees from each organization from 2014/15 to 2022/23

Organization*	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	Total
AAWSA	6	3	19	0	30	2	11	60	15	146
EWTI	0	1	29	0	7	26	13	2	19	97
Foreign	0	0	0	0	0	35	0	0	0	35
GSE	0	2	4	0	0	2	41	0	0	49
MoIL	0	0	0	0	0	2	4	30	2	38
MoWE	0	0	7	0	5	13	26	20	31	102
NGO	0	1	0	0	17	1	0	5	26	50
Private	3	0	4	0	4	2	25	14	43	95
RWB	11	37	111	14	122	100	210	169	391	1,165
TVETC	68	99	50	48	25	58	1	23	350	722
TWSS	16	5	18	9	53	242	335	396	9	1,083
University	0	17	4	0	0	1	51	99	60	232
WO	1	10	0	0	94	18	2	3	6	134
WWCE	11	6	64	5	43	26	67	47	0	269
WWDSE	1	0	47	0	18	9	20	0	373	468
ZO	2	0	1	0	18	8	33	39	103	204
Other	2	0	8	0	10	8	36	71	18	153
Unknown	80	184	58	395	19	27	0	5	3	771
Total	201	365	424	471	465	580	875	983	1,449	5,813

* AAWSA: Addis Ababa Water and Sewage Authority, GSE: Geological Survey of Ethiopia, MoIL: Ministry of Irrigation and Lowland, MoWE : Ministry of Water and Energy, RWB: Regional Water Bureau, TVETC: Technical and Vocational Education and Training College, TWSS: Town Water Supply Service, WO: Woreda Office, WWCE: Water Works Construction Enterprise, WWDSE: Water Works Design and Supervision Enterprise, ZO: Zonal Office

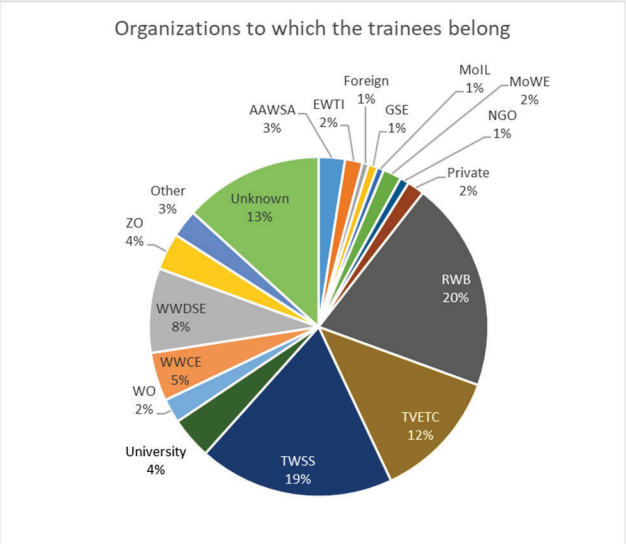


Figure 5: Proportion of EWTI trainees by affiliation from 2014/15 to 2022/23 (Total)

Table 7 and Figure 6 show the home regions of EWTI trainees. Although the trainees from Addis

Ababa, Oromia and Amhara make up about 65% of the total, the EWTI also accepts trainees from all regions including remote ones depending on the size (population) of each region. Trainees from Tigray has been almost suspended after the Tigray war in the year 2020/2021. Figure 7 shows the comparison of trainees' home region by the number of training courses between 2017/18 and 2022/23 for reference. The proportion of each region appears different, but it changes each year and does not indicate a particular transition.

Table 7: Number of trainees from each region from 2014/15 to 2022/23

Region	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	Total
Addis Ababa	12	51	154	138	86	55	209	220	172	1,097
Afar	11	15	22	12	110	46	29	39	91	375
Amhara	25	92	42	58	57	156	136	218	277	1,061
Benishangul	9	13	37	34	21	33	17	12	10	186
Dire Dawa	4	6	7	10	1	3	18	16	25	90
Gambella	10	23	8	15	1	9	33	31	8	138
Harar	4	5	1	1	11	5	16	12	3	58
Oromia	29	78	90	96	69	129	300	274	577	1,642
Sidama	-	-	-	-	-	-	-	-	77	77
SNNPR	18	22	12	73	56	38	88	106	113	526
Somali	65	23	14	16	20	13	21	53	88	313
SWEPR	-	-	-	-	-	-	-	-	6	6
Tigray	14	37	37	18	33	50	8	2	2	201
N/A	0	0	0	0	0	43	0	0	0	43
Total	201	365	424	471	465	580	875	983	1,449	5,813

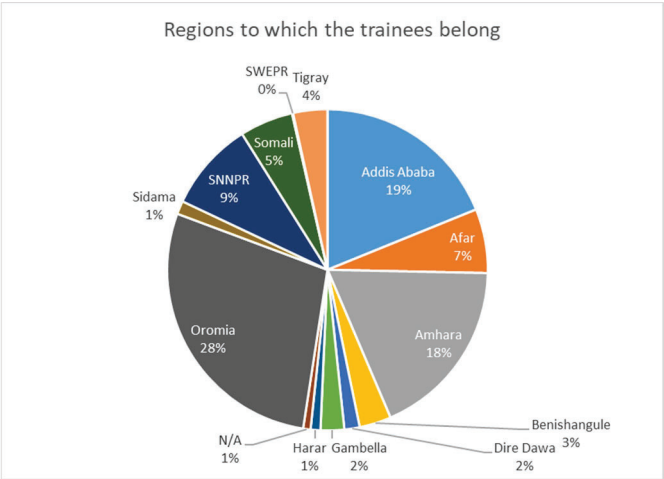


Figure 6: Percentage of EWTI trainees by region from 2014/15 to 2022/23 (Total)

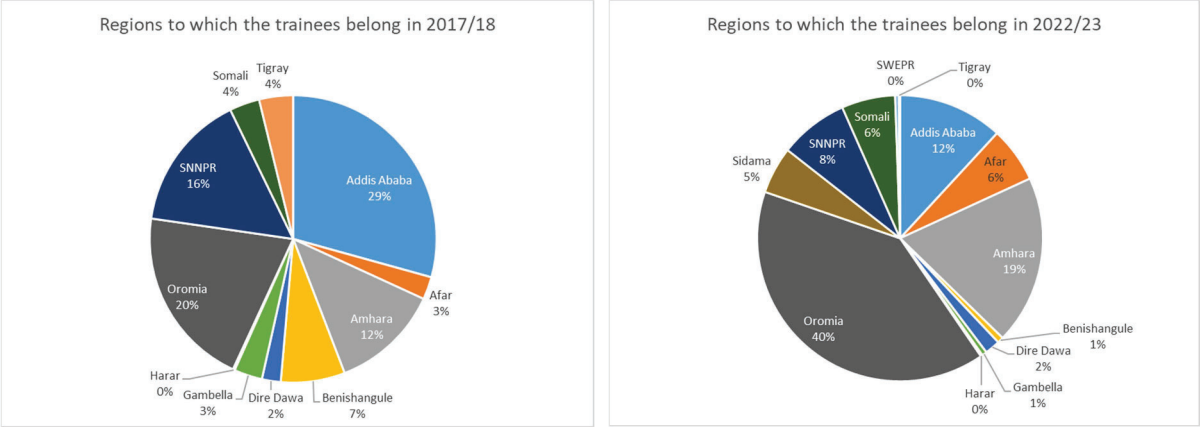


Figure 7: Comparison of trainees' home region by the number of training courses between 2017/18 and 2022/23

Figure 8 shows the gender balance of EWTI trainees. According to this analysis, the proportion of female trainees is less than 15% over the last 9 years and there has been no significant change.

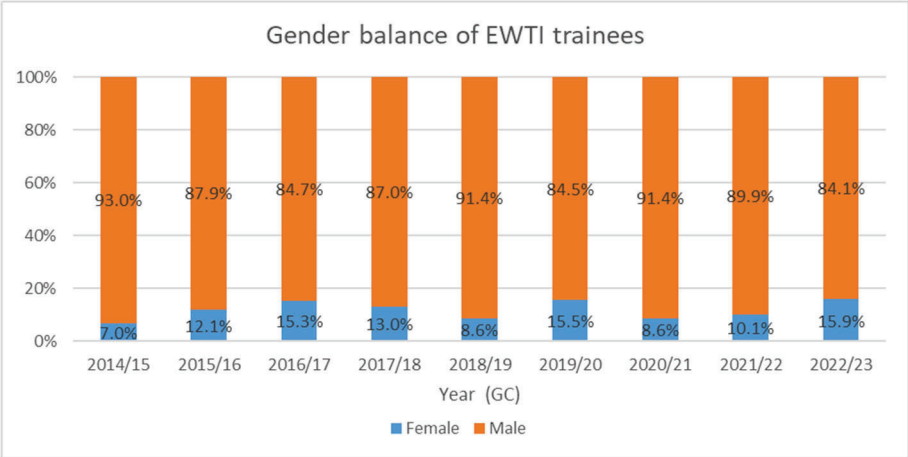


Figure 8: Gender balance of EWTI trainees from 2014/15 to 2022/23

2-5 Training modules and schedule

- During the project period, EWTI decided to adopt the module system for the organization of training courses (Guidelines)
- The training modules should be prepared by the course leader and trainers in charge, and are to be approved by Training Management Committee (TMC), according to the Guidelines (4.2 Preparation, Approval, Evaluation and Revision for Learning Modules).
- All training materials should be prepared, utilizing the standard TTLM formats, stipulated in the Guidelines. The standard TTLM formats are set in line with the TTLM Guidelines issued by Ministry of Education but modified uniquely by EWTI, incorporating the concepts of Instructional Design.

- The compulsory components of TTLM are;
  - Learning Module
  - Performance Evaluation Guide
  - Resource Requirements for Learning Module
  - Training Course Announcement
  - Training Schedule
  - Session Plan
  - Learning Guide
  - Pre/post Test
  - Pre/post training questionnaire
- There are four sets of TTLMs (Drilling Fluid Engineering, Gen-set (Generator Operation and Maintenance), Water Supply Engineering Software Application, and Non-Revenue Water Management (NRW)) of the training materials undergo a rigorous testing, approval, and validation process to ensure their quality and compliance with the guidelines.
- The WSSE department experienced a substantial increase in training courses over the course of the project period than any other department.

2-6 Annual training schedule:

Annual training schedule of 2023/24 (sample of two months) Ethiopian fiscal year is shown as table below. Compared to the commencement of the Project, the annual training plan was prepared regularly, and EWTI has attempted to operate the training according to the plan as much as possible.

ETHIOPIA WATER TECHNOLOGY INSTITUTE

TENTATIVE ANNUAL TRAINING SCHEDULE FOR 2023/24 G.C. OR 2016 E.C.

No.	Department	Training Courses Title	Training Days	No. of Trainees	Training Types	Date of Delivery		
						Start	End	
1	WSSE	Project Mgt & Construction Contract Adminstration	12	16	Ondemand	3-Jul-23	July,15/2023	D
2	WRDD	Ground Water Modelinng	10	16	Regular	July 10/7/2023	15/07/2023	D
3	REDT	Design & Implementation of Solar PV home System & Water Pumping	*8*	*10*	Regular	July 10/2023	July 19/2023	ND
4	IDET	Irrigation & Drainage system Management, operation& Maintenance	15	10	Regular	July 10/2023	July 21/2023	ND
5	WRDD	Drilling Fluid Engineering (DFE)	24	25	Ondemand	July 24/7/2023	July 18/08/2023	D
6	EMDMMT	Electromechanical Equipments Operation and Maintenance (Switch Board and Genset)	10	10	Ondemand	July 31/2023	August 9/2023	D
7	WSSE	Water Supply Production, Distribution and Water Quality	7	13	Ondemand	July 31/2023	August 9/2023	D
8	WSSE	MVS Budgeting and Financial Accounting	10	13	Ondemand	July 31/2023	August 9/2023	D
9	WSSE	MVS management	10	30	Ondemand	July 31/2023	August 9/2023	D
10	EMDMMT	Control board installation and Maintenance	10	14	Regular	July 31/2023	August 11/2023	
		AUGUST						
11	REDT	Solar Water Pumping System Installation, Operation, and Maintenance	10	10	Regular	August 7/2023	August 18/2023	ND
12	WSSE	Non-Revenue Water Mangt.	5	12	Regular	Aug., 7/2023	Aug., 11/2023	ND
13	WSSE	CR-Water Safety Plan and Water Quality Monitoring and Surveillance	5	12	WaterAid	Aug., 14/2023	Aug., 18/2023	ND
14	WSSE	Hydraulic Network Modelling Using Water-GEMS	6	23	Ondemand	August 14/2023	19-Aug-23	D
15	IDET	Diversion Weir & Canal Design Using Civil 3D Software Application	10	10	Regular	August 07/2023	August 18/2023	ND
16	EMDMMT	Generator Operation & Maintenance	10	10	Regular	August 14/2023	August 25/2023	ND
17	EMDMMT	Pump Operation and Maintenance	7	14	Regular	August 14/2023	August 22/2023	ND
18	WSSE	Key Performance Indicator (KPI) and Business Plan Dev't	5	12	Regular	Aug., 21/2023	Aug., 25/2023	D
19	WRDD	Water Well Diagnosis and Rehabilitation	10	30	UNICEF	28-Aug-23	9/7/2023	D

Figure 9: Sample annual training plans

3 Training needs analysis

- According to the Guidelines for Training Operation and Management, TNA must be conducted every three years to assess skill gaps and review current training courses. EWTI conducted TNA during the project period in 2020. The TNA process generally involves gathering data through surveys, interviews, and performance evaluations to identify specific areas where practitioners require additional training.
- The Training Needs Assessment was conducted across the country, covering 6 out of the 9 total regions, which is 66.6%, as well as 1 of the 2 administrative cities, which is 50%. This assessment provided a more holistic understanding of the key skill gaps and development requirements within the target population. The study's findings were positioned to have a meaningful impact on training programs and initiatives moving forward.
- The results of the survey generally indicate a high demand and positive attitude from the water sector towards EWTI's short-term training courses. As a result of TNA analysis some courses were identified and recommended by regional water offices and utilities.
- The following courses were recommended and newly added as a result of the Training Needs Assessment:

- -GIS and Remote Sensing
- -Solar Pumping System Design and Operation
- -Contract Administration and Project Management

■ Unfortunately, since the above TNA in 2020, another TNA has not been conducted, except the follow-up survey attempted by the Project Team. The follow-up survey also faced serious difficulties as the domestic travels were seriously restricted due to the country security situation since November 2021.

4 Training plans and selection of trainees

4-1 Annual training plan preparation and approval

■ Guiding manuals or guideline for planning, which was not available at the start of the project is now available. Planning and approval process of EWTI's annual training plan is shown in item No.3 of Guidelines for Training Operation and Management.

■ EWTI has referred superior plan such as GTP and 10 years' development perspective plan since 2020 and before that EWTI was referring the 5 years GTP.

Table 8: 5-year Strategic plan strategic goals and targets (2019/20 – 2024/25)

Strategic Goals	Indicators	Base-line 2012	Accumulated Targets (annual target)				
			2013	2014	2015	2016	2017
Goal 1: Short and practical training and long-term training program for 8130 trainees	Short-term	4160	5460 (1,300)	6902 (1,442)	8468 (1,566)	10184 (1,716)	12070 (1,886)
	Long-term	-	20	60	120	180	240
Goal 2. Capacity building training and technical support for 1170 TVET leaders and trainers on various topics.	# leaders & trainers	570	745 (175)	940 (195)	1190 (250)	1440 (250)	1740 (300)
Goal 3. Conducting 43 research on water supply coverage, irrigation and drainage technology and renewable energy for the benefit of the community.	# research	10	14 (4)	19 (5)	25 (6)	33 (8)	53 (20)
Goal 4 .Transfer 36 technologies to benefit the community to improve water supply and sanitation, irrigation and drainage technology and renewable energy development and utilization	# tech-nology	8	12 (4)	17 (5)	23 (6)	29 (6)	44 (15)
Goal 5. Providing diagnostic and testing services on 605 samples in	# research	1	2 (1)	3 (1)	5 (2)	5 (0)	5 (0)

5 research fields (physico-chemical, micro-biology, radioactivity, acoustic-biology and water engineering inputs)	# sample tests	40	90 (50)	165 (75)	295 (130)	440 (145)	605 (165)

- Method and Process of Planning: according to the Guidelines for Training Operation and Management, at the start of each new academic year, primary direction and annual planning schedules shall be set by the Training Management Committee (TMC). This initial direction by TMC is crucial in shaping EWTI's annual training plan, as well as other operational plans for the upcoming year. Then various departments and teams can develop their own respective plans. However, in practice, as per information obtained from the directorate of education and training directorate, there has been lack of uniformity in terms of utilizing the Guidelines for Training Operation and Management.
- The process of creating the Annual Training Plan begins with each department submitting a draft of proposed training activities and a corresponding timeline. This initial draft lays out the specific training needs and schedule for that department. The Water Technology Education and Training Directorate then reviews the draft, comparing the proposed training items against the overall organizational training schedule and resources. Based on this review, the Education and Training Directorate will prepare a tentative annual training plan incorporating any necessary modifications or adjustments. If there is no major comments or feedback after review of TMC, then the tentative plan will be finalized and adopted as EWTI's permanent annual training plan.

4-2 Selection of trainees

1) Course announcements

- Course announcement, selection and admission of trainees are clearly stipulated in the Guidelines (Chapter 5).
- The Guideline stipulates that course announcement should be sent to target organisations one and a half months prior to the start of the training (Guidelines 5.1)
- Course announcement should include the information entry requirements, course schedule and contents, in addition to the information already included at the inception of the Project, such as course title, date, acceptable number of participants and registration process.

2) Selection of trainees

- The flow of selection of trainees remains the same (see figure 9 below) as presented in the Baseline Survey Report, while the rules and standard procedures were clarified in the Guidelines.
- Entry requirements for each training course are included in the TTLM (trainers' guide) in consideration of the relative homogeneity of the trainees in the same batch. Mixture of the senior and junior trainees in the same batch was experienced in many training courses at EWTI in the initial stage of the Project. The Project Team advised to clarify the entry requirements for the same course so that the trainees have more or less similar levels of knowledge and skills at the entry. This

arrangement may increase the effectiveness of the training to avoid the situation where the training contents should not be adjusted to the different levels of trainees (and often well experienced trainees should wait until juniors reach to the similar level of understanding in the class).

- There were some cases observed during the project period that the organisations sent the trainees who did not fulfil the entry requirements. Awareness raising among the customer organisations was mentioned as important among EWTI trainers and training officers.

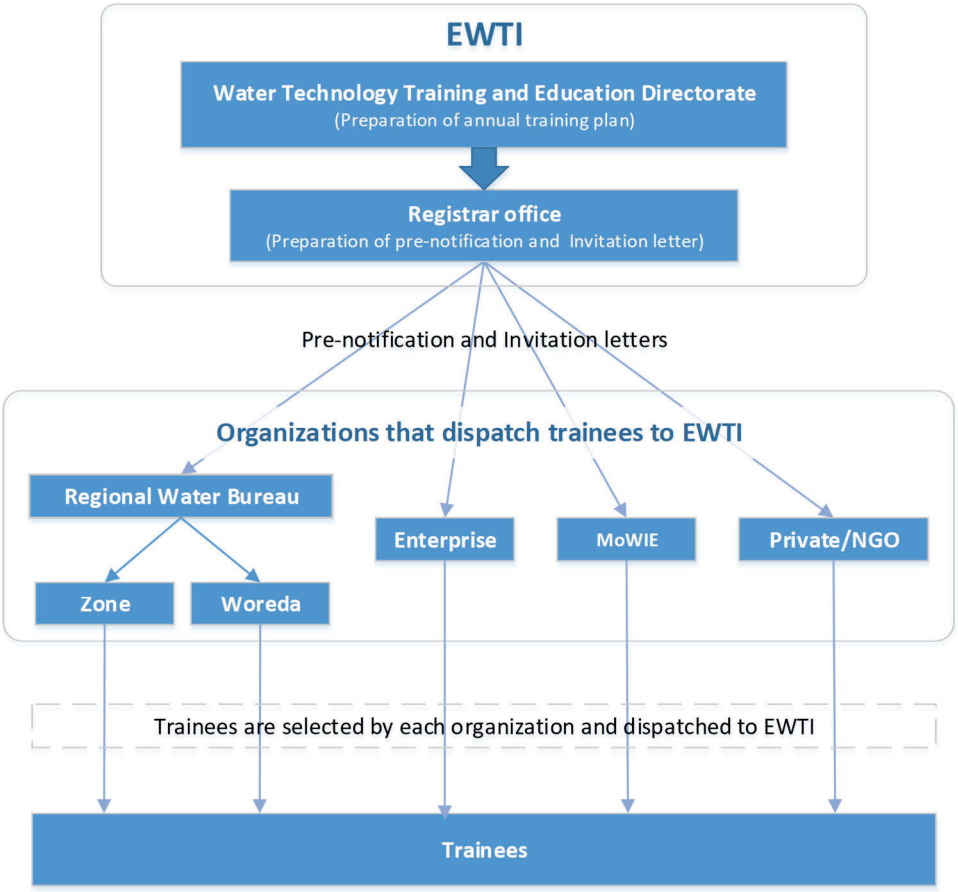


Figure 10: General flow of trainee selection for EWTI training courses

5 Training budget and procurement

5-1 Budget allocation for the past 5 years

The training budget for the last Ethiopian five fiscal years are presented in table 9 under the row titled as “water technology training program”.

Table 9: EWTI approved budget for 2018/19~2022/23 (EFY 2011~2015) (in Ethiopian Birr)

Budget Item	2011 (2018/2019)		2012 (2019/2020)		2013 (2020/2021)		2014 (2021/2022)		2015 (2022/2023)	
	Recurrent	Capital	Recurrent	Capital	Recurrent	Capital	Recurrent	Capital	Recurrent	Capital
Management & Administrative Program	10,000,000	-	10,031,000	-	11,000,000	-	16,550,000	20,000,000	20,982,733	1,428,640
Water Technology Training Program	8,200,000	22,800,000	6,861,000	17,154,000	7,105,000	10,000,000	8,500,000	23,000,000	6,710,000	18,800,000
Research & Tehnology Transfer Program	2,235,000	-	3,075,000	-	3,800,000	-	5,000,000	-	3,798,887	-
TVET Support & Competency Assessment	3,190,000	3,000,000	3,033,000	3,000,000	2,710,000	3,000,000	3,000,000	-	2,227,000	-
Specialized Laboratory Service Program	1,480,000	9,000,000	2,000,000	28,000,000	1,780,000	15,000,000	2,950,000	37,000,000	2,133,000	31,000,000
Sub-Total	25,105,000	34,800,000	25,000,000	48,154,000	26,395,000	28,000,000	36,000,000	80,000,000	35,851,620	51,228,640
Total	59,905,000		73,154,000		54,395,000		116,000,000		87,080,260	

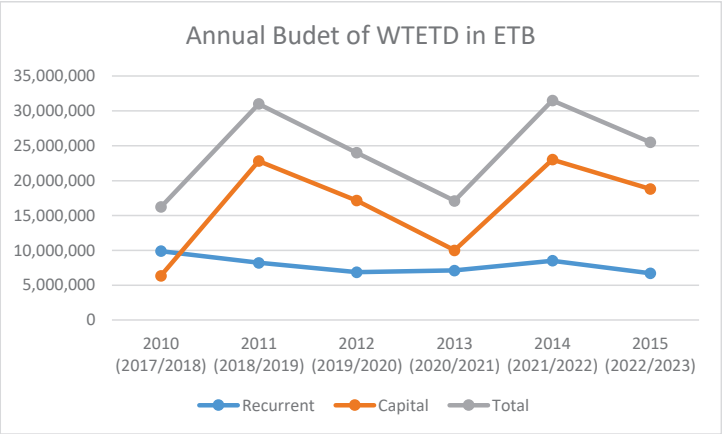


Figure 11: Annual WTETD budget (2017/18-2022/23)

The allocated budget for water technology training program over the past five Ethiopian (2010-2015) fiscal years have not had much improvement or has had no increasing trend due to mainly the internal conflicts that occurred in 2020/21 and which still persisted in some parts of the country. The detail budget breakdown by Ethiopian budget code is as shown in Annex 1.

Considering the high inflation rates in Ethiopia, the actual monetary values of budget may be in a decreasing trend.

Table 10: Inflation rates in Ethiopia[3]

Year	Inflation rate
2017	10.69%
2018	13.83%
2019	15.81%
2020	20.36%
2021	26.84%
2022	33.89%

(Source: WroldData.info)

Box 1: Purchasing power of Ethiopian Birr
(base year: 2017)

Inflation-adjusted purchasing power at the beginning of 2023: 33.53 birr
Increase in prices in 6 years: 198.25%
Decrease in value in 6 years: 66.47%

Conversely, if an item had a price of 100 birrs in 2017, it will cost 298.25 birrs at the beginning of 2023 due to inflation.

This corresponds to an average depreciation of 33.04 birr per year. The amount of the price increase corresponds to the overall inflation over this period.

Source: WorldData.info (www.worlddata.info/)

5-2 Process of budget planning

Process of budget planning remains the same as of the inception of the Project.

3 Source: https://www.worlddata.info/africa/ethiopia/inflation-rates.php#:~:text=The%20inflation%20rate%20for%20consumer,rate%20was%209.9%25%20per%20year.

Table 11: Process of budget planning

	Process	Timing (month)	Responsibility
1	Budget ceiling is notified from MoF to EWTI	January to February	MoF
2	Planning Directorate notifies to each Directorate to prepare and submit plans	Beginning of March	Planning Directorate
3	Each team prepares work plan and submit to Directorate	End of February	Each Directorate
4	Directorate compiles all plans of the teams and submits to Planning Directorate	March	Each Directorate
5	Planning Directorate compile EWTI's plan and submit to both MoWE and MoF.	Middle of March	Planning Directorate
6	Budget is approved by MoF and notified to EWTI	Around July 7	MoF

5-3 Challenges in budget implementation

Budget shortage has had some improvement over the past years but still persists.

6 Existing training courses and materials

6-1 Training contents

1) Evolution of training curriculum (contents)

- Training materials for all courses in EWTI are standardized as TTLM which is in line with the TTLM of Ministry of Education standards, with EWTI's unique modifications. The components, main distinctive features, approval and evaluation processes are clearly stipulated in the Guidelines.
- How the training curriculum and contents were evolved through pilot training is detailed in the report "Revolution of EWTI Technical Training (annexed to the Project Completion Report).

2) Proportion of lectures and practical exercises

- The proportion of time allocation for lectures and practices are recommended as 3:7 since the beginning of the Project period. However, the calculation of time allocation was not standardized and often allocation of practice time was often done with incorrect method. For instance, the time allocated as "practice in workshop/field" were sometimes used as "lecture in workshop/field" from the Experts' observation.
- Table below shows the changes in time allocation of different activities in the pilot training of Drilling Fluid Engineering course (DT). The lecture-practice ratio changes from 28:72, 79:21 to 24:76 in the 1st to 3rd pilot training.

Table 12: Time allocation of different activities in DT pilot training

Activity	Pilot 1		Pilot 2		Pilot 3	
	Time	%	Time	%	Time	%
Lecture in Class	10:03	14	9:33	23	3:39	4
Lecture in Workshop/Field	5:06	7	12:21	30	7:39	9
Self-check	3:05	4	2:17	6	3:22	4
Practical Exercise in Workshop/Field	42:16	60	3:06	8	36:32	41
LAP test	6:13	4	3:11	8	11:06	13
Preparation	2:10	3	7:16	18	7:18	8
Tea break	1:46	3	3:03	7	18:15	21
Total Hours	70:39		40:47		87:51	
Lecture-Practice Ratio		28:72		79:21		24:76

- The lecture in class and in workshop/field decreased from 15:09 (21%) to 11:18 (13%), comparing the 1st and 3rd pilot training, while the time allocated for practical exercise in workshop/field was reduced from 42:16 (60%) to 36:32 (41%).
- Reduction of the time for practical exercise was because the method of exercise changed to more controllable way delivered in the EWTI compound, rather than conducting the exercise in the drilling site in the field, in which the trainers often faced unpredictable troubles which prolonged or stagnated the training scheduled activities.
- Changes in time allocation of Gen-set Operation and Maintenance Course (EMMT) is shown in the table below. Lecture time both in class and workshop/field was proportionally reduced from the 1st to 3rd pilot training; 32% to 13%. This reduction was done mainly by reducing less important training contents (e.g. engine part explanation).

Table 13: Time allocation of different activities in EMMT pilot training

Activity	Pilot 1		Pilot 2		Pilot 3	
	Time	%	Time	%	Time	%
Lecture in Class	5:32	13	4:42	11	4:58	6
Lecture in Workshop/Field	7:46	19	7:42	18	5:55	7
Self-check	1:59	5	2:31	6	11:45	13
Practical Exercise in Workshop/Field	21:15	51	20:03	47	33:58	38
LAP test	2:48	7	5:50	14	12:58	14
Preparation	0:43	2	0:31	1	5:29	6
Tea break	1:23	3	1:32	3	14:18	16
Total Hours	41:26		42:51		89:21	
Lecture-Practice Ratio		39:61		36:64		33:67

3) Training delivery: standardization of training contents

- At the beginning of the Project, the training contents written on the textbooks were not fully delivered during the training and how the contents were delivered was all depended on the trainers.

- Delivery rate of the training contents increased through the process of the 1st and 2nd Pilot Training and reached to 100% in the 3rd Pilot Training for DT and EMMT. In this way, the training contents of each training module are standardly delivered to the trainees, regardless of who deliver the training and when the training is delivered.

6-2 List of training materials

- EWTI decided to modify all training materials into the TTLM standard formats, stipulated in the Guidelines and as of July 2024, all regular training courses are delivered utilizing the standard TTLM. The list of training modules and course materials uploaded to the portal site is presented in table 14.
- In early 2019, there was an initial attempt to upload materials on the portal site. This periodic engagement continued on the portal over the course of the project period. The second upload in September 2022, and a final upload to the portal was made in December 2023.
- Of the listed EWTI's training modules, 16 TTLMs have been uploaded on the EWTI's portal. The uploaded TTLM documents contain core components of Teaching Training and Learning Materials (TTLM). These basic TTLM components include the LG's Instruction Sheet, Self-Check, Information Sheet, Operation Sheet and LAP Test.
- A growing number of on-demand training courses are delivered at EWTI, but the training materials of some the on-demand courses may not strictly comply with the rules stipulated in the Guidelines.

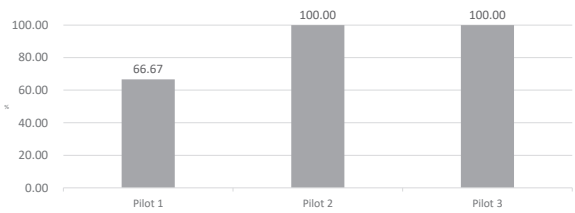


Figure 12: Rate of contents delivery (DT) in Pilot Training

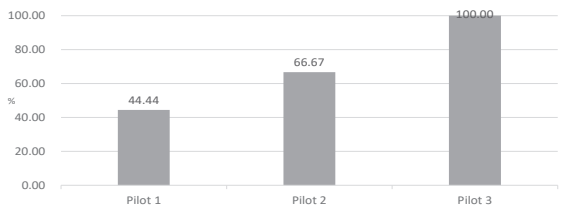


Figure 13: Rete of contents delivery (EMMT) in Pilot Training

Table 14: List of training modules and uploaded TTLM to EWTI portal site

No	Departements	Training Module Title	TTLM Title	TTLM uploaded
1	Collab.Metro. Age.	Post Graduate Diploma In Metrology		
2	Dirc.Regi.	Training Meterology Trainees		
3	WRDDT	Drilling Technology		
4	WRDDT	EMMT for TVET Trainers and Trainees		
5	WRDDT	Geographyical Information System (GIS) and Remote Sensing		
6	WRDDT	Groundwater Adminstraion and Management		
7	WRDDT	Groundwater Investigation and Development		
8	WRDDT	Water Resource Management		
9	WRDDT	Water Well Diagnosis and Rehabilitaion		
10	WRDDT	Drilling Fluid Engineering	Drilling Fluid Engineering	Yes
11	WRDDT	Water well Drilling trouble shooting		
12	WRDDT	Drilling Machinery Maintenance		
13	WRDDT	Water well Drilling Supervision	Drilling Supervision 1 and 2	Yes
14	WSSE	Water Supply Engineering (including Water-GEMS /CAD/ and SAP software application)	WSE Application Software	Yes
15	WSSE	WSE for TVET Trainers and Trainees		
16	WSSE	Project Management and Contract Administraion	Planning Projects and Scheduling Using Software and Contract Administration	Yes
17	WSSE	Non-Revenue Water Management	Non-revenue	Yes
18	WSSE	Urban Sanitation Management	Urban Sanitation Management	Yes
19	WSSE	Fecal Sludge Management using Shit Flow Diagram(SFD)		
20	WSSE	CR-Water Saftey Plan		
21	WSSE	Water Treatement and Water Quality Monitoirng and Surveillance		
22	WSSE	Key Performance Indicator (KPI)		
23	WSSE	Business Plan Development		
24	WSSE	Water Board Operation, Customer Forum, Customer Service Management		
25	WSSE	Sewerage Engineering (Sewer-GEMS Software Application		
26	WSSE	GIS for Pipe Networking		
27	WSSE	Sanitaion and solid waste Managemnt		
28	WSSE	Plumbing and HDP and PE Welding		
29	WSSE	Asset Management		
30	WSSE	Water Service Management		
31	WSSE	Pro-poor, Equity and Inclusion WASH Service Approach		
32	IDET	Irrigation and Drainage System Management, Operations and Miantenace		
33	IDET	Surface water Irrigation Study and Design		
34	IDET	Diversion Weir and Canal Design Using Civil 3D Software Application	Diversion Wire Study and Canal Layout Using AutoCAD Civil 3D and GIS	Yes
35	IDET	Irrigation Engineering	Operation and Maintenance of Irrigaiton Scheme	Yes
36	IDET	SAT 2001	Structural Analysis of Software Application for Irrigation Engineering	Yes
37	EMMT	Drilling Machinery Operation and Maintenance		
38	EMMT	Electromechanical Machinery Operation and Maintenance		
39	EMMT	Air Compressor Operation and Maintenance	Air Compressor O and M	Yes
40	EMMT	Generator set Operation Maintenance	Gen-set O and M	Yes
41	EMMT	Pump Operation and Maintenance	Pump O and M	Yes
42	EMMT	Switch Board Installation, Operation and Maintenance	Switch Board O and M	Yes
43	EMMT	Hydraulic System Operation and Maintenance		
44	EMMT	Operating of Electromechnical Machinery		
45	EMMT	Design and Implementation of Solar PV Home System and Water Pumping		
46	REDT	Solar Water Pumping System Installation, Operation and Maintenance		Yes
47	REDT	Solar Water Pumping system, Sizing, Installation,Operation and Maintenance for Multiplepurpose Application		

6-3 Preparation and approval process of TTLM

- Formulation, approval and evaluation of Learning Module (LM) and TTLM are stipulated in the Guidelines (chapter 4).
- All regular courses prepared the standard TTLMs but some TTLMs have not been officially approved by TMC as stipulated in the Guidelines.
- Preparation and approval of TTLMs for on-demand courses is not fully monitored by TMC and EWTI management. This issue needs to be addressed in the future.

6-4 How to keep training materials:

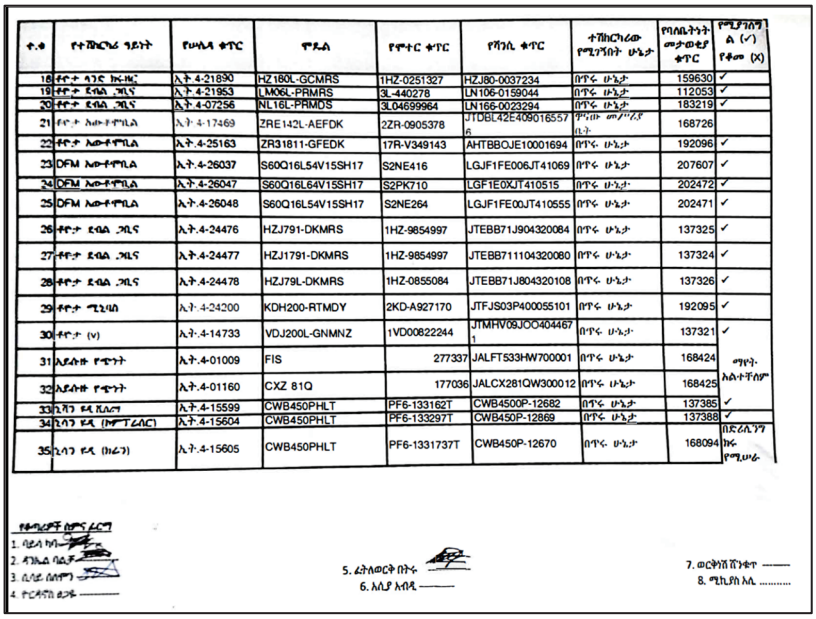
- The Guidelines stipulate that the library should collect and organize the curriculum and TTLMs

(both in hard and soft copies) and make them available for users (Guidelines 10.11.3). However, it is not fully implemented.

- An attempt was made to keep the latest TTLMs in the NAS (network attached storage), but NAS was not effectively utilized.
- A portal site was established and some TTLMs were uploaded (see table 14).
- Many TTLMs are still under the responsibility and management of trainers, except the ones uploaded to the portal site. It is critical for EWTI to implement secure digital platforms or physical sources, to keep the TTLMs.

6-5 Equipment

- Annual inventory of equipment is usually carried out at the end of every fiscal year.
- The Maintenance Team was established in February 2019 to upkeep the conditions of the machinery and equipment necessary for the training. There are many attempts to maintain the regular inspection and maintenance activities by the Maintenance Team during the Project, but the activities have been stagnated.



ተ.ቁ	የተሽከርካሪ ዓይነት	የሠሌዳ ቁጥር	ሞዴል	የሞተር ቁጥር	የሻንሲ ቁጥር	ተሽከርካሪው የሚገኝበት ሁኔታ	የባለቤትነት መታወቂያ ቁጥር	የሚያገለግል ል (✓) የቆመ (X)
18	ቶዮታ ላንድ ክሩዚር	ኢት 4-21890	HZ 180L-GCMRS	1HZ-0251327	HZJ80-0037234	በጥሩ ሁኔታ	159630	✓
19	ቶዮታ ደብል ጋቢና	ኢት 4-21953	LM06L-PRMRS	3L-440278	LN106-0159044	በጥሩ ሁኔታ	112053	✓
20	ቶዮታ ደብል ጋቢና	ኢት 4-07256	NL16L-PRMDS	3L04699964	LN166-0023294	በጥሩ ሁኔታ	183219	✓
21	ቶዮታ ኤሎተሞቲል	ኢት 4-17469	ZRE142L-AEFDK	2ZR-0905378	JTDBL42E409016557 6	ምስጡ መሥሪያ ቤት	168726	
22	ቶዮታ ኤሎተሞቲል	ኢት.4-25163	ZR31811-GFEDK	17R-V349143	AHTBBOJE10001694	በጥሩ ሁኔታ	192096	✓
23	DFM ኤሎተሞቲል	ኢት.4-26037	S60Q16L54V15SH17	S2NE416	LGJF1FE006JT41069	በጥሩ ሁኔታ	207607	✓
24	DFM ኤሎተሞቲል	ኢት.4-26047	S60Q16L64V15SH17	S2PK710	LGF1E0XJT410515	በጥሩ ሁኔታ	202472	✓
25	DFM ኤሎተሞቲል	ኢት.4-26048	S60Q16L54V15SH17	S2NE264	LGJF1FE00JT410555	በጥሩ ሁኔታ	202471	✓
26	ቶዮታ ደብል ጋቢና	ኢት.4-24476	HZJ791-DKMRS	1HZ-9854997	JTEBB71J904320084	በጥሩ ሁኔታ	137325	✓
27	ቶዮታ ደብል ጋቢና	ኢት.4-24477	HZJ1791-DKMRS	1HZ-9854997	JTEBB711104320080	በጥሩ ሁኔታ	137324	✓
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30	ቶዮታ (v)	ኢት.4-14733	VDJ200L-GNMNZ	1VD00822244	JTMHV09JOO404467 1	በጥሩ ሁኔታ	137321	✓
31	አይሱዙ የጭነት	ኢት.4-01009	FIS	277337	JALFTS33HW700001	በጥሩ ሁኔታ	168424	ማሃኑ አልተቻለም
32	አይሱዙ የጭነት	ኢት.4-01160	CXZ 81Q	177036	JALCX281QW300012	በጥሩ ሁኔታ	168425	
33	ጊሻን ደረ ጂሊና	ኢት.4-15599	CWB450PHLT	PF6-133162T	CWB4500P-12682	በጥሩ ሁኔታ	137385	✓
34	ጊሻን ደረ (ኮምፕሬሰር)	ኢት.4-15604	CWB450PHLT	PF6-133297T	CWB450P-12869	በጥሩ ሁኔታ	137388	✓
35	ጊሻን ደረ (ከራን)	ኢት.4-15605	CWB450PHLT	PF6-1331737T	CWB450P-12670	በጥሩ ሁኔታ	168094	በድሪሊንግ ከሩ የሚሠራ

Figure 14: Sample of equipment inventory

- EWTI is awaiting for the new structure of the institute to be fully operational and the sections who are responsible for the operation and maintenance of the machinery and equipment for training act accordingly. Training and consultancy desks of each technical fields are responsible for it.

7 Trainers

7-1 Number of trainers

Table 15: Number of trainers -baseline 2017/end-line 2024 survey

Department	Training Courses in charge	Total No. of approved position	No. of existing staff	No. of vacant position
Office of WT Education & Training Directorate /Director/		1/**1**	1/**1**	0/**0**
Water Resource Development & Drilling	GI, DT, Well Rehabilitation	15/**25**	9/**10**	6/**15**

Department	Training Courses in charge	Total No. of approved position	No. of existing staff	No. of vacant position
Technology Education & Training Department	GIS and Remote Sensing			
Electro-Mechanical & Drilling Machineries Maintenance Technology	DMMT, EMMT, EMMT for TVET	16/**13**	9/**7**	7/**6**
Irrigation & Drainage Engineering Technology Education & Training Department	Irrigation and Drainage	9/**9**	5/**4**	4/**5**
Water Supply & Sewerage Technology Education & Training Department	WSE, Contract Administration and Project Management, Sanitation and Solid Waste Management, Non-revenue Water Management, Water Service Management WSE for TVET	11/**11**	9/**7**	2/**4**
Renewable Energy Development Education & Training Department		8/**14**	1/**3**	7/**11**
Total		5.4/**73**	6.05/**31**	3.5/**42**

Training for meteorology trainees, and post graduate diploma in meteorology are given by another department were delivered by the outsourced trainers.

- The number of approved positions of trainers in EWTI as of June 2024 reached 73 which showed significant increase compared to the number registered during the baseline survey in 2017 which was 60. The total number of positions for trainers increased by 21.6% and this showed the structural expansion of EWTI with its operation but due to less attractiveness of the existing EWTI salary scale or incentive mechanism it was neither possible to retain the employed staff nor the salary attractive enough for new recruits on vacant positions.

7-2 Educational background and working experience

- The summary of the trainers' educational background in Water Resources Development and Drilling Technology Department (WRDDT) and Electro-mechanical and Drilling Machinery Maintenance Technology Department (EM/DMMT) is shown in the tables below;

Table 16: Educational background of the project counterpart staff (for 4 courses)

Department	Course in charge	Master degree holder	Bachelor degree holder	Others	Total
Director	-	1/**1**	0/**0**	0/**0**	1/**1**
WRD/DT	GI, DT	3/**3**	4/**3**	2/**4**	9/**10**
EM/DMMT	DMMT, EMMT	1/**1**	5/**5**	3/**1**	9/**7**
Total	-	3/**5**	2.33/**8**	3.5/**5**	3.19/**18**

(baseline/**end-line)**

Table 17: Work experiences of the project counterpart staff (for 4 courses)

Department	Course in charge	1-10	11-20	More than 21	Total
Director	-	0/**0**	1/**0**	0/**1**	1
WRD/DT	GI, DT	4/**4**	3/**5**	2/**1**	9/**10**
EM/DMMT	DMMT, EMMT	4/**2**	2/**3**	3/**2**	9/**7**
Total	-	-6/**6**	-7.73/**8**	24.5/**4**	3.19/**18**

(baseline/**end-line**)

- As per baseline record of 2017, there were only two COC holders of EWTI trainers with Level II whereas as of June 2024 there are 32 EWTI trainers who certified with COC ranging from Level II to Level V with details as shown with Anne 4.

7-3 Capacity of trainers to deliver training

1) Trainers' capacity in instructional design

- In order to see the progress in the trainers' capacity in instructional design competency, the same self-evaluation was conducted in 2017, 2019 and 2024.
- Instructional design competency includes the areas of A. Research and analysis, B. Training development and C. Training delivery and evaluation, D. Information and knowledge management and E. Activities management (see table 18).

Table 18: Checklist for instructional design and management competency

Core Competency	Check List
A. Research and Analysis	1. Understanding of what and how to conduct action research for planning of training program
	2. Development of the Research Instruments (Field plan, check lists, questionnaire, etc.)
	3. Implementation of action research (Interview, questionnaire, Focus Group Discussion, etc.)
	4. Data analysis and report writing.
B. Training Development	5. Planning of Training (Set proper objectives, target, methodology, course contents, etc.)
	6. Development of the training materials (Handout, Presentation, Teaching aid etc.)
	7. Development of Assessment tools (level 1 - 4 Evaluation of training)
	8. Improvement of Training program based on the results of the field validation
C. Training Delivery and Evaluation	9. Designing of the delivery plan (Assignment plan, scheduling, training plan)
	10. Presentation and facilitation of the training program
	11. Evaluation of Training (Quantitative and Qualitative)
	12. Report Writing (Effectiveness, efficiency of the training, Lesson Learned)
D. Information and Knowledge Management	13. Use of ICT (Word, Excel, Power Point, e-Mail, Web browser, SNS etc.)
	14. Collecting Information and knowledge (Through resource documents, Report, Website etc.)
	15. Organizing the Information and Knowledge (Filing, archiving, indexing, storing, etc.)
	16. Sharing I&K (Regular meeting, newsletter, official Gmail, update FB, etc.)
E. Activities Management	17. Planning of the Activities (Monthly, trimester, annual plan)
	18. Process Management (Update of the Schedule, countermeasure and lesson

Core Competency	Check List
	learned)
	19. Output Management (Submit on time, received approval by the director/client, etc.)
	20. Report Writing (Report of planning, process, and output management)

- The results of the self-evaluation show that all trainers show their improvements in all aspects describe in table 18.

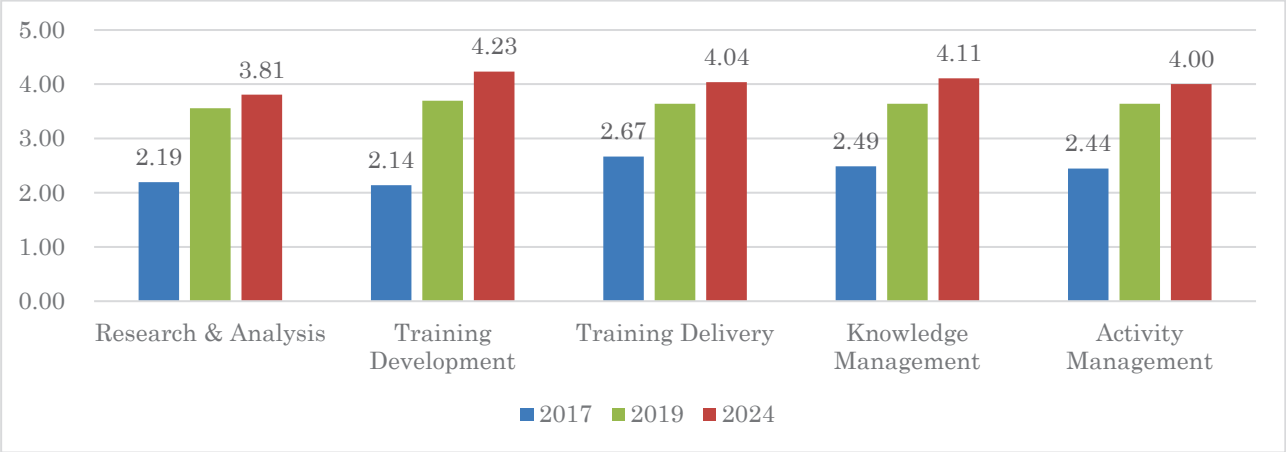


Figure 15: Self-evaluation results: average scores in each ID competency (2017, 2019 and 2024) 1

Figure 16: Self-evaluation results: average scores in each ID competency (2017, 2019 and 2024) 2

- Both figure 16 and 17 show the improvement of the trainers' capacity in ID competencies. The improvement in training development aspect was the most (from 2.14 to 4.23) while the least one is training delivery (from 2.67 to 4.04). This could be because training delivery aspect was already experienced well by the trainers as it was scored highest at the beginning.
- Figure 18 shows the individual improvement of ID competencies. All individual trainers found themselves with improved capacities in ID (see Annex 2 for details) .

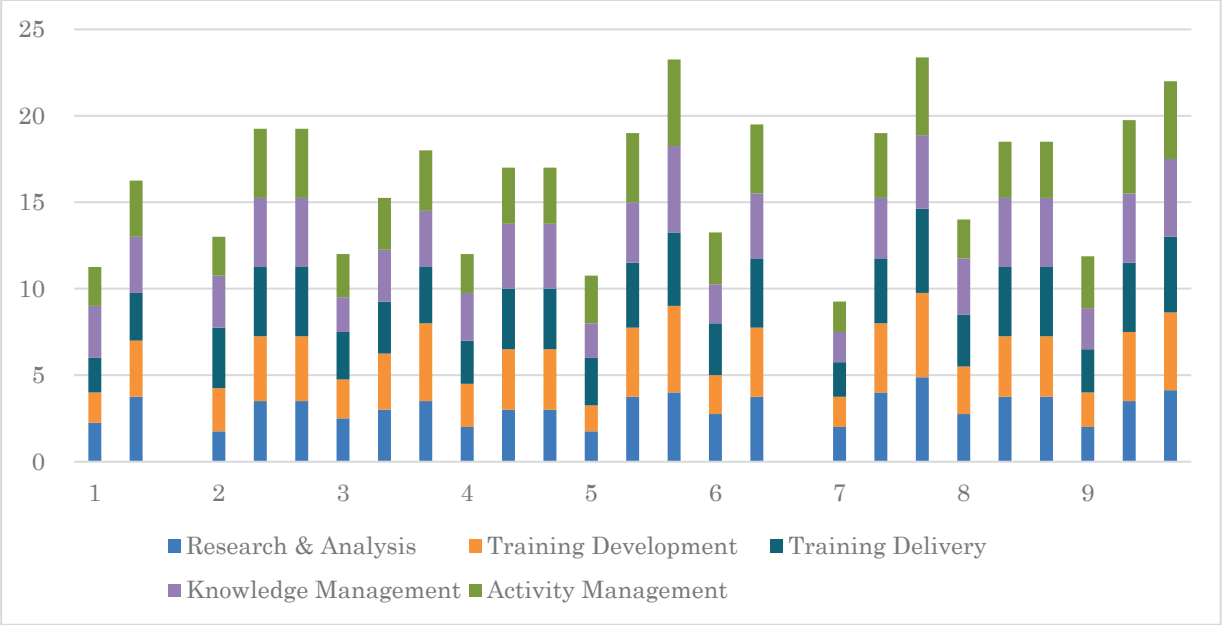


Figure 17: Individual improvement in ID competencies

2) Trainers' capacity in technical fields

- A number of technical training sessions were conducted during the Project to strengthen technical competencies of trainers.
- Similar self-evaluation in technical competency was not conducted as most technical staff changed their positions or left the organization and it was difficult to compare the changes.
- The evaluation of each trainer in technical aspects was done by the Japanese Expert and the details are given as Annex 9 of the Project Completion Report.

7-4 External Trainers

- The number of contractual employments of external professional trainers in EWTI starting from year 2016 to 2021 is as shown in the table 18.
- The number of external professional trainers' employment showed declining in EWTI and over the last three years stopped at all. This indicated that EWTI's trainers have become more capable over the past five years in conducting the training courses by themselves.

Table 19: Number of external trainers

Year	No of External Trainers in EWTI
2016	4
2017	5
2018	7
2019	3
2020	1
2021	1
2022	0
2023	0

8 Monitoring and evaluation system

8-1 Method of training evaluation

1) Training participants assessment

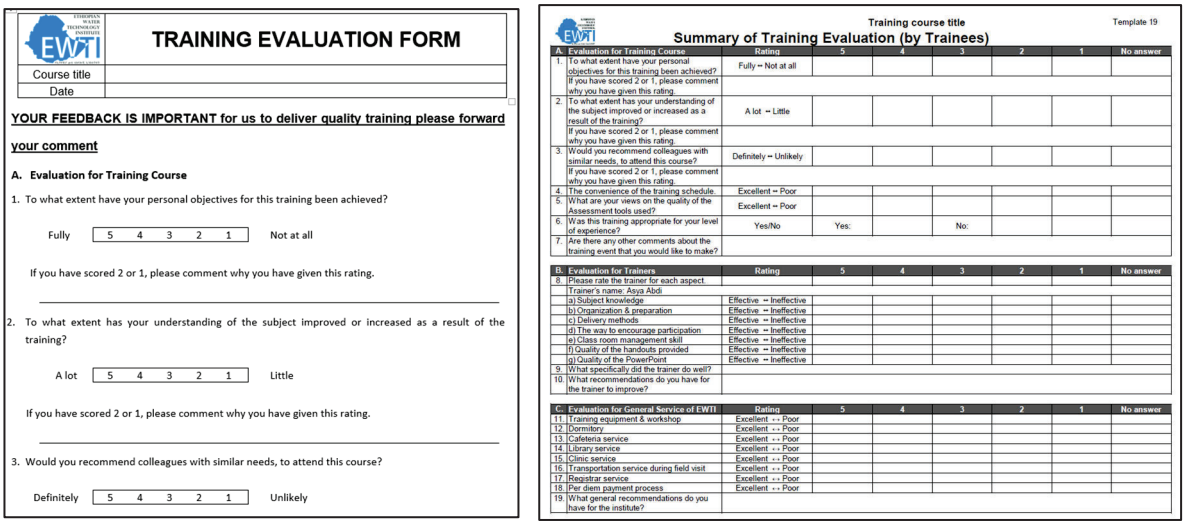
- The method and procedure of training participants' assessment are stipulated in the Guidelines (Chapter 7).
- The assessment is done both in knowledge and practical skills, according to the Performance Evaluation Guide attached to TTLM (Guideline 7.1)
- The participants are certified either certificate of completion or certificate of participation, according to the results of the knowledge test (post test) and practical skill tests (LAP tests) (Guidelines 8).
- The pre/post tests are administered by the registrar while the LAP tests are organized by the trainers. The results are recorded and kept by the registrar.

2) Training evaluation by training participants

- The method and procedure of training evaluation is stipulated in the Guidelines (Guidelines 7.2).
- EWTI adopts the four-level training evaluation; reaction, learning, behaviour and results (Guidelines 7.2).
- Training evaluation by the training participants are conducted daily, weekly and end of the course, according to the Guidelines (7.2)
- Questionnaires are distributed to trainees on paper at the end of a training course to evaluate training. A standard questionnaire was developed during the preparation of the Guidelines. The questionnaire consists of the following three parts.

  A. Evaluation for training course
  B. Evaluation for trainers
  C. Evaluation for general service for EWTI

- The Registrar collects the questionnaires from each trainee and summarizes the answers in the summary template in Excel format by the Registrar as shown in Figure 19. This summary makes the analysis of the training result easy.



TRAINING EVALUATION FORM

Course title	
Date	

YOUR FEEDBACK IS IMPORTANT for us to deliver quality training please forward your comment

A. Evaluation for Training Course

1. To what extent have your personal objectives for this training been achieved?

Fully | 5 4 3 2 1 | Not at all

If you have scored 2 or 1, please comment why you have given this rating.

2. To what extent has your understanding of the subject improved or increased as a result of the training?

A lot | 5 4 3 2 1 | Little

If you have scored 2 or 1, please comment why you have given this rating.

3. Would you recommend colleagues with similar needs, to attend this course?

Definitely | 5 4 3 2 1 | Unlikely

Training course title — Template 19

Summary of Training Evaluation (by Trainees)

A.	Evaluation for Training Course	Rating	5	4	3	2	1	No answer
1.	To what extent have your personal objectives for this training been achieved?	Fully ↔ Not at all						
	If you have scored 2 or 1, please comment why you have given this rating.							
2.	To what extent has your understanding of the subject improved or increased as a result of the training?	A lot ↔ Little						
	If you have scored 2 or 1, please comment why you have given this rating.							
3.	Would you recommend colleagues with similar needs, to attend this course?	Definitely ↔ Unlikely						
	If you have scored 2 or 1, please comment why you have given this rating.							
4.	The convenience of the training schedule.	Excellent ↔ Poor						
5.	What are your views on the quality of the Assessment tools used?	Excellent ↔ Poor						
6.	Was this training appropriate for your level of experience?	Yes/No	Yes:		No:			
7.	Are there any other comments about the training event that you would like to make?							

B.	Evaluation for Trainers	Rating	5	4	3	2	1	No answer
8.	Please rate the trainer for each aspect.							
	Trainer's name: Asya Abdi							
	a) Subject knowledge	Effective ↔ Ineffective						
	b) Organization & preparation	Effective ↔ Ineffective						
	c) Delivery methods	Effective ↔ Ineffective						
	d) The way to encourage participation	Effective ↔ Ineffective						
	e) Class room management skill	Effective ↔ Ineffective						
	f) Quality of the handouts provided	Effective ↔ Ineffective						
	g) Quality of the PowerPoint	Effective ↔ Ineffective						
9.	What specifically did the trainer do well?							
10.	What recommendations do you have for the trainer to improve?							

C.	Evaluation for General Service of EWTI	Rating	5	4	3	2	1	No answer
11.	Training equipment & workshop	Excellent ↔ Poor						
12.	Dormitory	Excellent ↔ Poor						
13.	Cafeteria service	Excellent ↔ Poor						
14.	Library service	Excellent ↔ Poor						
15.	Clinic service	Excellent ↔ Poor						
16.	Transportation service during field visit	Excellent ↔ Poor						
17.	Registrar service	Excellent ↔ Poor						
18.	Per diem payment process	Excellent ↔ Poor						
19.	What general recommendations do you have for the institute?							

Figure 18: Forms for training evaluation by trainees (left) and summary of the evaluation results (right)

- After every training course, the course leader should prepare the training completion report and submit it to the Director of WTETD (Guidelines 7.3)
- The standard contents and attached documents are also stipulated in the Guidelines (Guideline 7.3)
- The implementation of the Guidelines is also assessed by the Director of WTETD, the course leader, trainers, and the registrar. Google-form was prepared for easy handling of data and WTETD is to announce the use of the form electronically as of July 2024.

8-2 Frequency of training evaluation

- Training evaluation by training participants (level 1 and level 2) are conducted daily, weekly and at the end of training course as stated above (Guidelines 7.2)
- Level 3 and level 4 evaluation are to be conducted after six months of training and every three years respectively according to the Guidelines (Guideline 7.2).
- Training Needs Assessment (TNA) was conducted once by EWTI in 2020.
- During the project period, level 3 and level 4 evaluation was conducted once for the pilot training. Due to the impact of COVID-19 and domestic conflicts, the collected data were extremely limited.

8-3 Way to reflect the results

- The method and procedure to conduct training course evaluation, revision and cancellation are stipulated in the Guidelines (Guidelines 4.1.3).
- TMC is responsible for initiating the above process, but the functions of TMC are limited as of July 2024.
- As results of the TNA in 2020, some new training courses were added.

8-4 How is the evaluation data kept

The answers for the questionnaire from the trainees (on paper) are filed and stored in the Registrar's

office but the Registrar prepares a summary of questionnaire result for each training course using the template in Excel format. The summary of each training course evaluation is saved in the computer of the Registrar's office.

8-5 Summary of evaluation results by the trainees

As of November 2022, 199 evaluation summary sheets had been prepared and saved in the Registrar's office (30, 80, 74 and 15 in 2019/2020, 2020/2021, 2021/2022 and 2022/2023, respectively). These data were analyzed by the Project and the results are shown below.

8-5-1 Evaluation for training courses

Trainees' satisfaction with the provided training courses are gathered through the questionnaire. The questions asked are listed below. To make it easier to quantify the responses, questions 1 to 5 are rated on a 5-point scale.

1. To what extent have your objectives for this training been achieved? (If you have scored 2 or 1, please comment why you have given this rating.)
2. To what extent has your understanding of the subject improved or increased because of the training? (If you have scored 2 or 1, please comment why you have given this rating.)
3. Would you recommend colleagues with similar needs, to attend this course? (If you have scored 2 or 1, please comment why you have given this rating.)
4. The convenience of the training schedule.
5. What are your views on the quality of the Assessment tools used?
6. Was this training appropriate for your level of experience? (Yes/No)
7. Are there any other comments about the training event that you would like to make? (narrative)

Figure 19 shows the evolution of the average score of all trainees including all training courses for the question "A. Evaluation for training course" over the past 4 years. At the earlier stage of the project in 2019/2020, question No. 4 "The convenience of the training schedule" shows the lowest score in all questions, which is 4.11 out of 5 and the highest score was obtained by the question No.2 "To what extent has your understanding of the subject improved or increased as a result of the training?", which is 4.29. While the lowest score remains on the same question that is question No.4 in 2022/23 with 4.32, question No.3 "Would you recommend colleagues with similar needs, to attend this course?" reaches to the highest score with 4.48 in 2022/23. The average score of all 5 questions also increased by 4%, from 4.21 to 4.39, which means that overall, the total satisfaction of participants has slightly improved over the past 4 years. Especially, the question No.3 shows the biggest increase during these 4 years the by 5.8%.

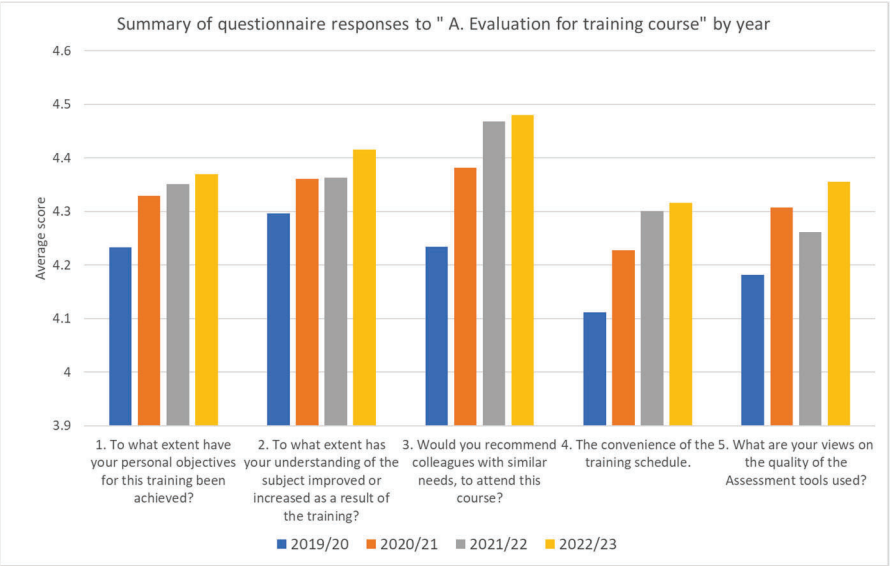


Figure 19: Summary of questionnaire responses to "A. Evaluation for training course" by year (maximum score is 5)

Figure 20 shows the summary of analysis for the same questions by department. The EMMT and REDT departments resulted in higher rates with around 4.5 out of 5 points in all 5 questions. The IDE department, however, scored the lowest in all questions, which are below 4 points.

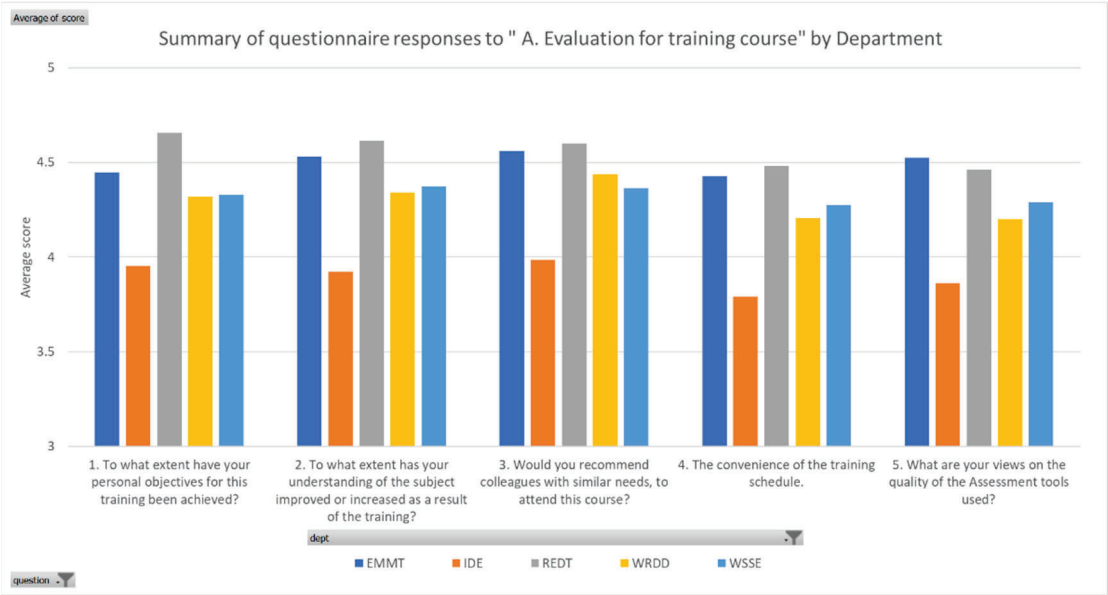


Figure 20: Summary of questionnaire responses to "A. Evaluation for training course" by Department (maximum score is 5)

Figure 21 shows the percentage of participants who answered YES to the question No.6 “Was the training appropriate for your level of experience?” Over the past 4 years, more than 95% of trainees have responded that they feel the level of training is appropriate to their level of experience every year.

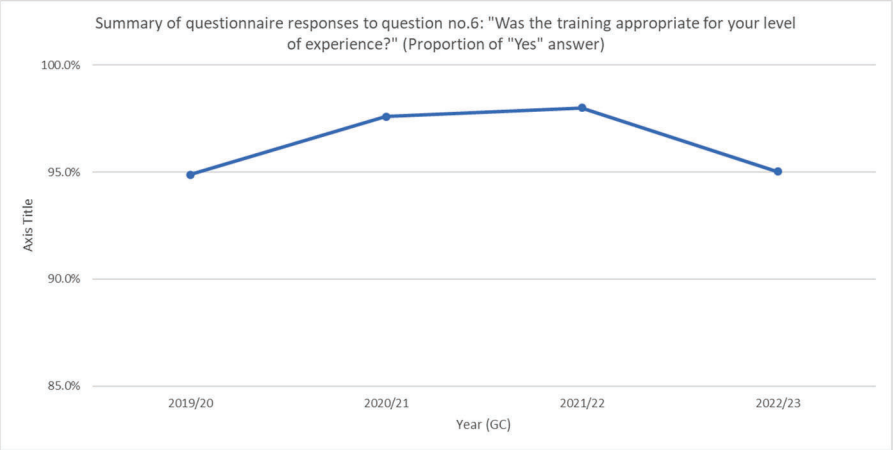


Figure 21: Summary of questionnaire responses to question no.6: "Was the training appropriate for your level of experience?" (Proportion of "Yes" answer)

8-5-2 Evaluation for trainers

This section of the training evaluation questionnaire collects data on the competency of trainers who have delivered EWTI training courses. Seven questions are asked, ranging from 1 (ineffective) to 5 (effective). All the questions are listed below.

a) Subject knowledge
b) Organization & preparation
c) Delivery methods
d) The way to encourage participation
e) Classroom management skill
f) Quality of the handouts provided
g) Quality of the PowerPoint

Figure 22 shows the average scores for each of the above questions over the last 4 years. For all the questions, the scores are above 4.5 points, indicating that the participants are generally close to satisfied with the trainers. Even though, the scores appear to increase from year to year, with the exception of the score for 2020/21, which is remarkably high for all the questions.

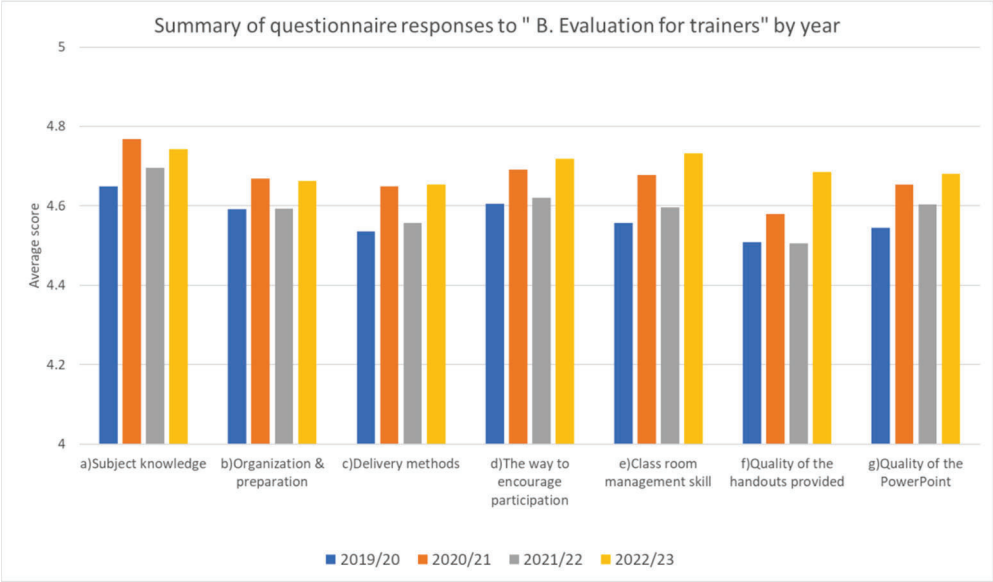


Figure 22: Summary of questionnaire responses to "B. Evaluation for trainers" by year (maximum score is 5)

Table 20 shows the average scores of the evaluation for trainers from 2019/20 to 2022/23. Comparing scores between 2019/20 and 2022/23, all the questions show an increase, particularly “e) Classroom management skills” and “f) Quality of handouts”, which show the highest increase of all questions at 3.9%. This could be attributed to the impact of introducing TTLM through the project as teaching and learning and materials for both trainers and trainees.

Table 20: Average score of the evaluation for trainers from 2019/20 to 2022/23

Questions	2019/20	2020/21	2021/22	2022/23	4-year rate of increase
a) Subject knowledge	4.65	4.77	4.70	4.74	2.0%
b) Organization & preparation	4.59	4.67	4.59	4.66	1.6%
c) Delivery methods	4.54	4.65	4.56	4.65	2.6%
d) The way to encourage participation	4.60	4.69	4.62	4.72	2.5%
e) Classroom management skill	4.56	4.68	4.60	4.73	3.9%
f) Quality of the handouts provided	4.51	4.58	4.51	4.69	3.9%
g) Quality of the PowerPoint	4.54	4.65	4.60	4.68	3.0%

When looking at the details of each department, EMMT and REDT trainers have relatively higher overall average scores, while IDE trainers have the lowest, as shown in Figure 23. This trend is similar to that in the questionnaire part A “Evaluation for training courses” summarized in Figure 20.

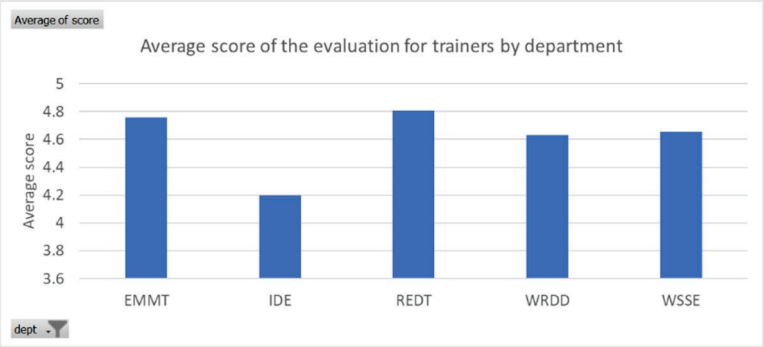


Figure 23: Average score of trainers' evaluation from 2019/20 to 2022/23 by department

This does not mean, however, that IDE have made little improvement in the competence of trainers. Figure 24 shows the evolution of the average score in each department. IDE showed a significant improvement from 2019/20 to 2021/22, while maintaining the lowest score of all the departments in all 4 years. In fact, IDE trainers increased their scores by 4.1% in 4 years, which rate is the highest rate of increase among all the departments.

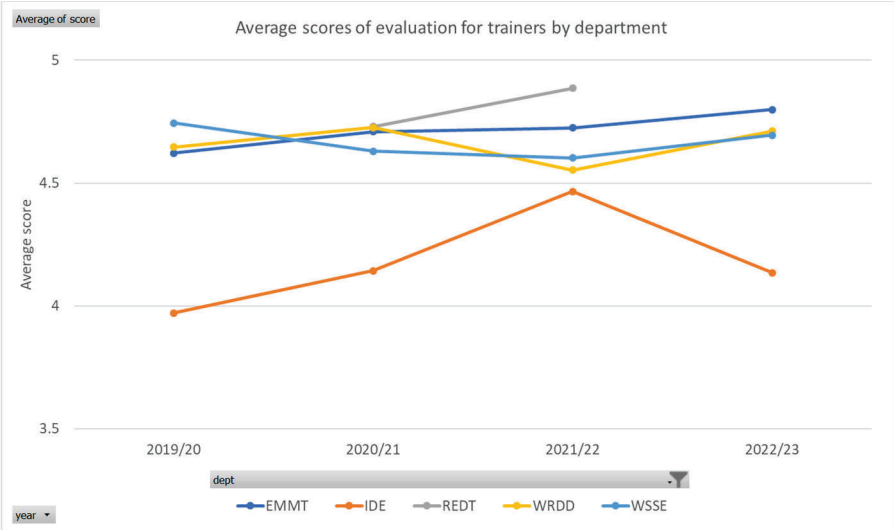


Figure 24: Evolution of average scores of evaluations for trainers from 2019/20 to 2022/23 by department

In addition, Figure 25 shows a comparison of the average evaluation scores for internal and external trainers over the last 4 years. This is the result of 38 internal and 3 external trainers. Both internal and external trainers show a steady increase in their average scores each year. Over the period, the external trainers have relatively higher scores with an average of 4.7, while the average score for internal trainers is 4.6 over 4 years.

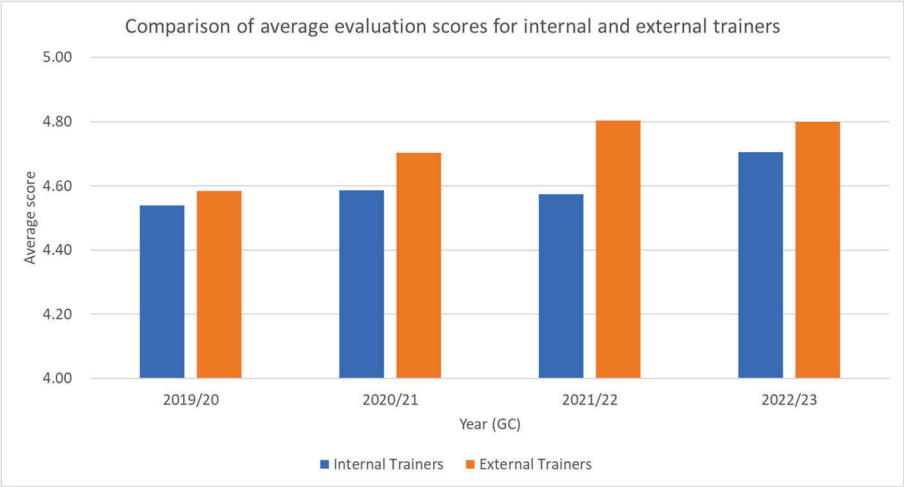


Figure 25: Comparison of average evaluation scores for internal and external trainers from 2019/20 to 2022/23

8-5-3 Evaluation for general service for EWTI

The third part of the questionnaire collects data on the facilities and general service of the EWTI. 8 criteria were rated on a scale of 1 (ineffective) to 5 (effective), with an open-ended question on recommendations at the end.

1. Training equipment & workshop
2. Dormitory
3. Cafeteria service
4. Library service
5. Clinic service
6. Transportation service during field visit
7. Registrar service
8. Per diem payment process
9. What general recommendations do you have for the institute? (narrative)

Figure 26 shows the average scores for each criterion over the last 4 years. Overall, half of the criteria including “1. Training equipment & workshop”, “2. Dormitory”, “6. Transportation service during the field visit” and “7. Registrar service” show relatively high scores above 4 points and even a steady increase in scores from 2019/20 to 2021/22. Among these criteria, the score of the registrar service is outstanding over 4.5 points. The project's development of training guidelines and various templates could have contributed to give a positive impact on the Registrar’s work to facilitate the procedures for training implementation.

On the other hand, other criteria such as “3. Cafeteria service” and “4. Library service” and “5. Clinic service” remained lower scores below 3.5 points, as these services were suspended during the COVID-19 period, especially in 2020/2021. In addition, it is a matter of concern that the scores of the library

service and the clinic service have been in decline over the last 4 years.

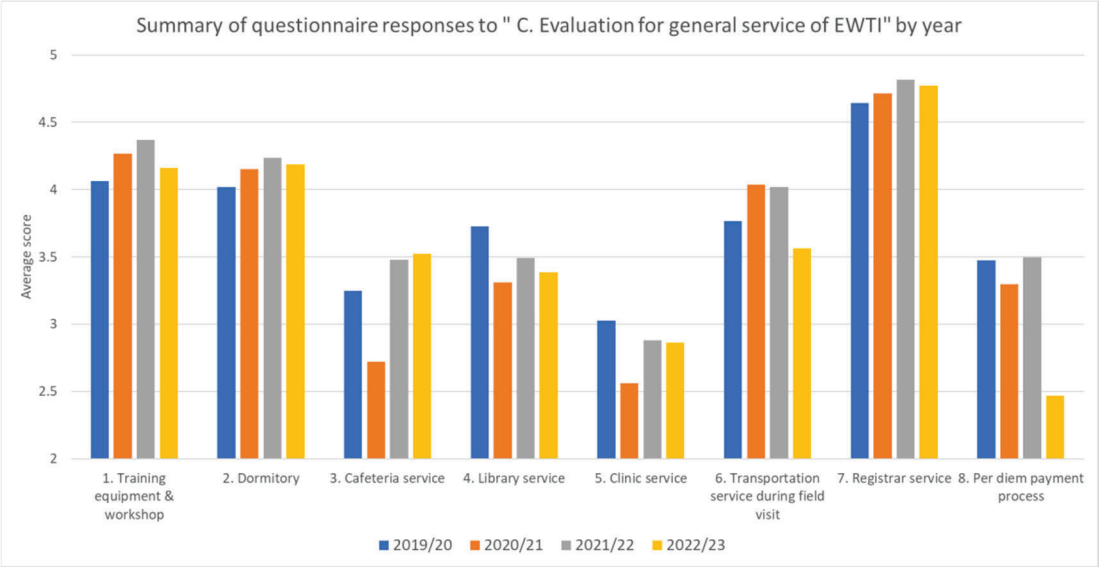


Figure 26: Summary of questionnaire responses for "C. Evaluation for general service for EWTI" by year (maximum score is 5)

9 Knowledge management

9-1 Training document management

A portal site for WTE&T Department was established aiming at creating a common space to store and share important documents including teaching and learning materials for the EWTI training courses within the institute in 2019. The portal holds immense potential for becoming a centralized source of information, allowing the institute to efficiently organize and categorize its vast collection of knowledge resources. From the mission and vision of the institute to the schedules of training programs, the portal displays a wide range of important information. This comprehensive display ensures that the EWTI staff has easy access to essential details, fostering alignment with the institute's objectives. The portal's ability to share various types of information, including documents, presentations, and multimedia content, further enhances its value as a dynamic platform for sharing knowledge.

The portal site, despite its potential, has not been properly utilized, leading to missed opportunities for knowledge management and resource utilization. As of today, a total of 15 training materials in addition to the training management guidelines and related templates have been uploaded onto the portal site. However, although a knowledge management team was formed to oversee the portal's maintenance and content management within the department, it did not function effectively on updating and managing the portal. By periodically uploading new training materials and relevant information, the portal remains an invaluable resource for EWTI. The portal was last updated on September 29, 2022, which implies that there has not been a recent update.

The portal site was repeatedly introduced to the EWTI trainers by the knowledge management team

and the trainers were encouraged to upload their training material and keep updating by themselves. However, this practice had not been institutionalized within the department. This is because there is still little understanding of necessity of sharing teaching and learning materials with others and they tend to belong to the trainers themselves. Another concerning aspect is the absence of regular internal reviews. It is important to periodically analyze the performance of the portal sites, identify areas for improvement, and implement necessary changes. Regular reviews also help ensure that the portal site aligns with the organization's goals and meets the needs of its users.

Lastly, while a knowledge management team has been formed to maintain and monitor the portal site, it appears to be that the responsibility primarily falls on one person. This raises concerns about the distribution of responsibilities within the team or the department.

9-2 Information management of training evaluation

- The Guidelines stipulate that the test results should be properly recorded in a Trainee's Record Book (TRB), Training Participant's Progress Chart and Training Participant's Assessment Data Sheet (Guidelines 7.1).
- Training evaluation records are kept in the files at Registrar Office, though the TRB has not been printed and utilized due to budget constraints.

9-3 Library

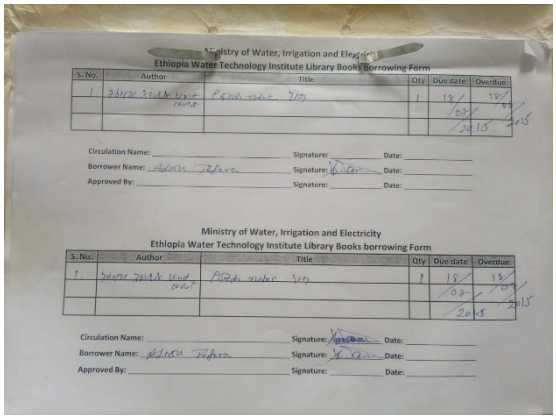
9-3-1 Library operation and management

The EWTI library is administered by a qualified librarian with a BSc degree in Information Technology and a diploma in Library Science. Currently, there are a few vacant positions that need to be filled to ensure the library has a skilled workforce. The librarian utilizes a separate room connected to the library as his office.

Library services play a crucial role in the institute by facilitating effective utilization and sharing of knowledge and resources. The library has undergone significant improvements and upgrades to enhance its services compared to the initial stage of the Project. Specifically, the library's future vision includes digitizing its resources and providing online e-book services, enabling trainers and trainees to access reference and technical books anywhere, anytime.

The library allows EWTI staff and trainers to borrow books for a period of one month. Trainees, on the other hand, can borrow books for the duration of their stay at EWTI. Prior to borrowing books, users are required to fill out a form and a librarian sign on it.

The EWTI library currently has 707 registered international and local books, as recorded in the library's record book. These books include reference books, documents, journals, newspapers, CDs, and e-book services, accessible through a membership privilege database system connected to the National Library and Archive. However, there are some noticeable gaps in the effective utilization of the library. The library's environment resembles more of a classroom than a proper library, with misplaced chairs and tables being observed.



Ministry of Water, Irrigation and Electricity
Ethiopia Water Technology Institute Library Books borrowing Form

S. No.	Author	Title	Qty	Due date	Overdue
1	[illegible]	[illegible]	1	18/07/2015	18/07/2015

Circulation Name: Signature: Date:
Borrower Name: Signature: Date:
Approved By: Signature: Date:

Ministry of Water, Irrigation and Electricity
Ethiopia Water Technology Institute Library Books borrowing Form

S. No.	Author	Title	Qty	Due date	Overdue
1	[illegible]	[illegible]	1	18/07/2015	18/07/2015

Circulation Name: Signature: Date:
Borrower Name: Signature: Date:
Approved By: Signature: Date:

Figure 27: Book borrowing form

Although there have been noticeable improvements in terms of better lighting and a clean environment, which provide comfort for users, there is still room for further improvement. The size of the library shelves and available space is insufficient to accommodate large-sized books, resulting in cluttered and unstructured arrangements.

9-3-2 Internet service for e-book

The library has a broadband Internet service, which enhances the efficiency of delivering online e-book services. Trainees can easily access the National Library and Archive database system with the assistance of the librarian, enabling them to read from wherever they are.

One of the main improvements is the addition of computer-based e-book services in the library. As can be observed, devices for accessing the internet in the library are installed on the wall. When trainees want to read within the library, they must present their ID to the librarian. Similarly, if they wish to borrow books, they must follow the borrowing procedures.

Efforts have been made to bridge the gap between training materials and library services. The objective was to integrate the training materials with library services. However, currently, the training material is still in the possession of the trainers.

The e-book service is one of the key areas of the library, connecting trainees, trainers, and EWTI staff to the digital library. With the assistance of the librarian, anyone can access and read additional information from e-book sources, including any reference book they desire. However, the library has

limitations in various areas when it comes to updated technical reference books.

9-3-3 Library usage

Though it is stipulated that the library should have a collection of TTLMs both in hard and soft copies, it is not practiced as of July 2024. Moreover, the library service was formerly accountable to WTETD but recently it has become accountable for Communication Directorate.

The current state of the library and its usage indicate several areas that require improvement. These include outdated books and resources, the necessity for technological upgrades involving computers, inadequate space for reading, and insufficient funds to acquire up-to-date books. According to the majority of trainers, the books and resources available in the library are outdated and lack significant relevance for skill gap training for the trainers. These materials fail to address the evolving needs of learners and do not adequately support their professional development. While there are ample resources and e-book access, majority of EWTI community remain unaware of the availability and utilization of these valuable resources.

Trainers emphasize the urgent need for the library to be equipped with additional computers, databases, and sufficient space for reading. The absence of these technological resources limits the accessibility of up-to-date information and inhibits learners' ability to engage in online research or utilize digital learning platforms. Despite the current infrastructure not being properly functional, trainers acknowledge the positive aspect of having some infrastructure in place, as it provides a foundation to build upon.

One of the key challenges faced by the library is the absence of a yearly budget allocated for updating its collection with recent books. Trainers often express concerns that a large number of books available in the library are not useful for the specific training programs they want to deliver at EWTI.

10 Public relations

Up to 2017, EWTI had published three newsletters with the name “Felege Hiwot”. During the EWTI/JICA project period, the project supported the publication of EWTI’s Newsletter with the name changed from “Felege Hiwot” into “Water Technology” for two editions which are News Letter Vol.5 in November 2019 and Newsletter Vol.6 in March 2020.

In addition to the support for the publication of the above stated two editions of “Water Technology” newsletters, EWTI/JICA project also supported EWTI for publication of EWTI training information booklet for three editions which contain information of EWTI’s water technology training courses which are useful for its customers. The first edition of the training information booklet contains information of 20 EWTI’ training courses and the 2nd edition contains information for the same number of training courses but it is different from the 1st edition by some editing on the TMC list whereas the 3rd edition contains training information for 37 EWTI training courses.

11 Human resource development and management of EWTI

11-1 Job description of EWTI staff

Job descriptions of the staff member have not been changes since the baseline survey (Annex 4 of the Baseline Survey Report).

New organizational chart, which was internally announced in June 2024 is attached as Annex 3. This is yet to be officially approved by the Civil Service Commission.

11-2 Human resource development and management

The Human Resource Training and Development Team under EWTI Human Resource Development and Management Directorate is the responsible unit to plan and organize EWTI staff training every fiscal year. However, except one training that was provided in February 2021 for 138 participants on training course entitled "orientation on civil service regulation", there was no other training planned and implemented by the HRD & Mgt directorate over the project period. The reason given for the lack of the trainings was mainly absence of allocated budget for staff training.

Training organized by some individual directorates of EWTI for their respective staff also occasionally conducted over the project period.

11-3 Staff evaluation:

Staff performance evaluation conducted using the civil service commission's staff evaluation form every six months in EWTI during the project period.

12 Satisfaction of trainees

12-1 Degree of satisfaction of past trainees

- Degree of satisfaction of trainees for the EWTI training courses can be measured from the results of evaluation carried out after every training course. The result is described in 8-5.

12-2 The results of the pilot training participants follow-up survey

The Project Team conducted a follow-up survey targeted the ex-participants of the 1st to 3rd pilot training courses. The following sections present the highlights of the results of the follow-up survey.

Table 21: Pilot training follow-up survey interview respondents (local)

Pilot	Course Title	Total ex-traniees	# Respondants
1	Gen-set O&M	13	1
	Drilling supervision	7	2
	Air Compressor O & M	14	1
	Total	**34**	**4**
2	Gen-set O&M	12	3
	Total	**12**	**3**
3	Gen-set O&M	6	0
	Drilling fluid Engineering	5	0
	Total	**11**	**0**

1) Local trainees:

According to the feedback obtained from the pilot training one participants, only one out of 13 potential Gen-set trainees was able to respond, and two out of 7 potential Drilling supervision trainees responded. Additionally, only one participant from the 14 potential Air Compressor O&M participants

was interviewed.

Despite the limited number of interviewed trainees, according to trainees comment the 1st pilot training was an absolute accomplishment and met expectations. The interviewed trainees found the training was relevant, valuable, and ignited new possibilities for problem-solving techniques. The majority of the interviewed trainees described the training as transformative and an eye-opening experience that had a profound impact on their skill development, providing them with valuable new capabilities. Overall, according to the interviewed trainees, the impact of the training extended beyond individual skill enhancement and had a positive impact on the delivery mechanisms in their respective organizations. Moreover, trainees overwhelmingly found the pilot training was highly valuable, provided them helpful new insights.

Out of the 12 pilot 2 ex-trainees of the 2nd batch pilot training, the interview team was only able to interview 3 of them. Regardless of the limited number of interviewed trainees, all of the participants commented that they found the training to be significantly enhanced their skills. The feedback from the 3 interviewed trainees indicates that the pilot 2 training program has improved the capabilities of trainees.

Table 22: Pilot training follow-up survey interview respondents (international)

Pilot	Course Title	Total ex-traniees	# Respondants
3	Drilling fluid Engineering	8	6
	Gen-set O&M	10	2
	Total	**18**	**8**

According to the pilot training 3 international training; out of a total of 8 ex-trainees of Drilling Fluid Engineering training, and 10 international Gen-Set O&M trainees, 6 and 2 were able to be interviewed by the interview team respectively. The international training courses for both Drilling Fluid Engineering and Gen-Set were highly impactful and effective in various areas. The interviewed Drilling Fluid Engineering and Gen-Set trainees highlighted how the training significantly improved their understanding and application of critical tools, as well as Kaizen concepts.

Moreover, the pilot training program had a substantial positive impact on the trainees, fostering a culture of continuous improvement. This was particularly evident in the realm of proper chemical measurement and equipment usage, as noted by the interviewed participants of Drilling Fluid Engineering course. Trainees reported that a noticeable improvement in their individual and collective performance. According to the international training trainees, the knowledge and skills gained through the training had a tangible, positive impact on their work.

12-3 Degree of satisfaction of past trainees' superior

The voices of the superiors of the ex-trainees of the 1st and 3rd pilot training were collected, though the samples are very small, due to the restrictions of domestic travels during the time of data collection.

Table 23: Pilot training follow-up survey interview respondents (trainees' superiors)

Titles of Respondants	Orgnzation	Titles of ex-Trainees	Organzaition	Title of Training courses/ Batch	Region	Town
Water supply scheme Admin. Team Leader	Zonal water office	Water Supply Schemes Technicia	Zonal Water office	Gen-set O&M (2), Feb 2019	SNNPR	Durame
Water supply scheme Admin. Deputy core process owner	Town Water Service Office	Design &Constrcution Coordinato	Town Water Service Office	Gen-set O&M (2), Feb 2019	South-West	Bench-maji
Water Supply Drilling process & Pump Testing Process head	Water Works Constrcution Enterprise	Hydrogeologist	Reginal Water Bureau	Drilling Supervision (1), Oct 2018	SNNPR	Hawassa
One WASH National Program Coordinator	Regional Water Bureau	Electro.Mechanical Engineer	Reginal Water Bureau	Gen-set O&M (1), Feb 2018	SNNPR	Hawassa
Zonal Water office Core process Cwner	Zonal water office	EMMT Technician	Zonal Water Office	Gen-set O &M (2), Feb 2019	SNNPR	Dilla
Machinery Vehicles O&M Dep. Deputy Manage	Water Works Constrcution Enterprise	Drilling Machinery Mechanic	Water Works Construction Enterprise	Air Compressor O&M, 2018	SNNPR	Hawassa

The number of supervisors the team interviewed were 6. Five of these supervisors were from the former Southern Nations Nationalities and People's Region (SNNPR), while one was from the South-West region. Although the geographic coverage of the respondents may not have fully represented all the pilot training regions, the interviewed supervisors still provided valuable insights based on their observations of former trainees within their respective organizations. Almost all the supervisors observed a positive and significant change in their former trainees. However, one supervisor commented on budget-related issues that were limiting the ability to send more trainees to the institute. Another supervisor raised a concern regarding the application requirements for future training opportunities at EWTI. Despite the overall positive feedback from the majority of supervisors, one supervisor indicated a problem of shortage of communication between the former trainees.

13 Base and end-line information related to the PDM indicators

Table 24: Base and end-line information related to the Overall Goals

Indicator	Base information	End-line Information
1 EWTI continues to conduct training courses based on the guidelines for training operation and management ~~and manuals on operational procedures for training~~ introduced by the Project	▪ EWTI basically follows the same training implementation procedure as that of EWTEC period. ▪ There are no guidelines and manuals on operational procedures for training.	▪ EWTI continues to conduct training courses based on the guidelines for training operation and management introduced by the project.
2 EWTI continues to conduct short-term training courses to trainees based on the developed manuals on training teaching and learning materials.	▪ EWTI does not have its own guidelines and manuals for teaching material preparation but preparation of guidelines on training operation and management has started by the initiative of EWTI. ▪ There is a manual on TTLM development prepared by Ministry of Education. TTLM has been introduced in all TVET colleges in the country and EWTI has intention to use the TTLM format for its short-term training courses (not yet realized).	▪ EWTI continues to conduct short-term training courses to trainees based on the developed manuals on training teaching and learning materials.
3 EWTI conducts capacity development for EWTI's trainers through internal training	▪ There are a few occasions of training for EWTI staff but not on planned basis.	▪ EWTI conducts capacity development for EWTI trainers through internal training in ad-hoc bases. ▪ EWTI continues annual TTLM review as internal training since 2019.

13-1 Base information related to the Project Purpose

Table 21 Base and end-line information related to the Project Purpose

Indicator	Base information	End-line Information
1. Guidelines on training operation and management prepared by the project are utilized for the four pilot areas of EWTI training programs	▪ There are no guidelines and manuals on training operational procedures. ▪ There is no standard procedure for training operation.	▪ The Guidelines version 3 with the attached formats were officially approved and being implemented in all training courses within EWTI
2. EWTI continues to conduct short-term training courses based on the developed learning module and training, teaching and learning materials.	▪ Pilot training is not yet conducted and satisfaction rate cannot be measured. ▪ The participants of current EWTI regular training courses in the past two years generally show high satisfaction according to the evaluation sheets submitted after completion of each training course.	▪ EWTI continues to conduct short-term training courses based on the developed TTLMs.

Indicator	Base information	End-line Information
3. The internal training system is institutionalized (planned, implemented and reported).	▪ There is no integrated plan for internal training based on the needs.	▪ Annual TTLM review workshops were planned, implemented and reported continually during the project period. ▪ OJT for the Maintenance Team was implemented, but the regular inspection and maintenance practices have not been routinised.

13-2 Base information for Outputs

Table 22: Base and end-line information for Project Outputs

Indicator	Base information	End-line Information
~~1-1 Annual training plans developed by the project are approved by EWTI~~ Training needs, training evaluation results are reflected to the following annual training plan.	▪ Annual training plans are developed based on the 5-year strategic plan. ▪ No reflection of TNA and TGS in the training plan. ▪ Training evaluation results are not systematically reflected into annual training plans.	▪ Findings from the 1st and the 2nd Pilot Training were reflected in the 3rd Pilot Training.
~~1-2 The guidelines and manuals on operational procedures for training version 1 is revised to version 2~~ The results of pilot training are reflected to guidelines on training operation and management.	▪ Currently there is no written standard procedure for training operation but guidelines on training operation and management is under preparation. ▪ Due to lack of guidelines and manuals, the following problems are observed. - Overlapping of training courses which causes shortage of accommodation - Delay of notification (invitation) of training courses - No complete training report (without evaluation)	▪ The Guidelines for Training Operation and Management version 3 were approved and the printed ones were distributed to the stakeholders.
1-3 International training course is operated and managed by Water Technology Education and Training Directorate (WTETD) once, utilizing the Guidelines for Training Operation and Management.	▪ No indicator at the inception	▪ 2 courses of international training were operated and managed by WTETD, utilizing the Guidelines. The trainees were accepted from Malawi and Nigeria.
2-1 ~~The developed manuals on training, teaching and learning materials are officially approved~~. Learning module and training, teaching and learning materials developed by trainers are	▪ Generally, the format prepared during EWTEC period is used for training modules but it is not officially standardized. ▪ No standard set of training materials.	▪ The learning modules and TTLM version 1 were revised into version 3, reflecting the lessons learned from the 1st and 2nd Pilot Training Courses. ▪ TTLM version 3 in two targeted fields (drilling

Indicator	Base information	End-line Information
officially approved.	▪ There is an effort to re-format the existing training modules by EWTI introducing the TVET standard. ▪ There is a manual on TTLM development prepared by Ministry of Education. TTLM has been introduced in all TVET colleges in the country and EWTI has intention to use the TTLM format for its short-term training courses (not yet realized).	technology and electromechanical machinery maintenance) were officially approved by TMC, printed and distributed to the stakeholders.
~~2-2 Lecturers in charge of pilot training courses attains the level of targeted capacity in capacity development plan~~ Trainers apply the practical knowledge (technical skills and pedagogical skills) gained from the capacity development training in the pilot training.	▪ Majority of trainers for all technical fields are in need of improvement in practical skills. ▪ Results of self-evaluation indicate relatively lower competency in Research & analysis and Training delivery.	▪ The trainers utilise the knowledge and skills acquired from the training provided by the Project in their training practices in three targeted field (groundwater development, drilling technology and electromechanical machinery maintenance). ▪ Though a pilot training has not been implemented in the field of drilling machinery maintenance, the Maintenance Team members acquired knowledge and skills through OJT.
2-3 More than 70% of trainees achieve the learning outcome set in a learning module at the end of the training course in the Pilot Training Courses, including the international course.	▪ No indicator at the inception	▪ -All participants of the 1st batch of 3 Pilot Training Courses gained the required levels of the marks at Self-check and LAP tests, except the ones who left the training for their own reasons during the Fluid drilling course.
3-1 Internal training materials and internal training plan are prepared and approved	▪ Although there are some training courses provided for EWTI trainers, there is no integrated plan of internal training within ETWI.	▪ TTLM for TTLM Revision (TTLM) was developed. This TTLM may be continually utilised for annual review of TTLM which is compulsory, stipulated in the Guidelines. ▪ Machinery maintenance process was recorded. This record will be utilized for the internal training in the future. ▪ Internal training has not been well incorporated in EWTI's annual training plans, except the regular practice of TTLM revision.
3-2 More than 80% of participants, who attend the internal training courses, after a series of the training courses, are satisfied with the contents of the internal training courses	▪ There is no evaluation conducted and there is no document for the internal training.	▪ More than 80% of participants successfully completed the internal training, e.g. TTLM review, OJT in technical fields.
3-3 Training materials for four technical areas	▪ No indicator at the inception	▪ Out of four targeted technical fields of training,

Indicator	Base information	End-line Information
(GWDM, DT, DMMT and EMMT) are kept in place.		TTLMs of 3 fields (groundwater development, drilling technology and electromechanical machinery maintenance) version 3 are kept in the portal site. Other 15 TTLMs are also kept in the same site. ▪ TTLM has not been made in the field of drilling machinery maintenance.
3-4 Terms of Reference for the Maintenance Team is approved by Director General	▪ No indicator at the inception	▪ TOR of the Maintenance Team was approved by DG.
3-5 Regular maintenance activities by the Maintenance Team are conducted for more than 6 months based on the TOR for the Maintenance Team.	▪ No indicator at the inception	▪ Regular inspection and maintenance have been attempted many times, but stagnated since November 2022. The regular maintenance as of the end of the Project is almost nil.

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Budget yeer 2011
Name of Zone /wereda: federal Code: 000
Name of program : Training Water Technology Technicians
Name of Sub agence: Code: 02/01/01
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2111101	6111	2,900,000.00			2,890,000.00
2	2111201	6121	30,000.00			120,000.00
3	2121101	6131	300,000.00			310,000.00
4	2211102	6212	300,000.00			155,000.00
5	2211103	6213				145,000.00
6	2211107	6217	570,000.00			770,000.00
7	2211108	6218	100,000.00			50,000.00
8	2221101	6231	1,000,000.00			1,200,000.00
9	2221102	6232	50,000.00			30,000.00
10	2221103	6233	50,000.00			110,000.00
11	2231107	6241	500,000.00			450,000.00
12	2241101	6251	600,000.00			450,000.00
13	2241109	6259				85,000.00
14	2251101	6271	300,000.00			475,000.00
15	2311101	6313	900,000.00			400,000.00
16	2311102	6314	600,000.00			560,000.00
		ድምር	8,200,000.00			8,200,000.00

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Budget yeer 2012
Name of Zone /wereda: federal Code: 000
Name of program : Training Water Technology Technicians
Name of Sub agence: Code: 02/01/01
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2111101	6111	2,500,000.00	499,000.93		2,999,000.93
2	2111201	6121	32,000.00			32,000.00
3	2121101	6131	275,000.00	62,757.04		337,757.04
4	2211102	6212	250,000.00			250,000.00
5	2211103	6213	200,000.00			200,000.00
6	2211105	6215	200,000.00			200,000.00
7	2211107	6217	700,000.00			700,000.00
8	2211108	6218	350,000.00			250,000.00
9	2221101	6231	1,200,000.00			1,520,000.00
10	2221102	6232	50,000.00			50,000.00
11	2231101	6243	100,000.00			50,000.00
12	2231107	6241	300,000.00			300,000.00
13	2241101	6251	400,000.00			300,000.00
14	2241103	6253	50,000.00			–
15	2311101	6313	154,000.00			154,000.00
16	2311102	6314	100,000.00			100,000.00
		ድምር	6,861,000.00	561,757.97		7,442,757.97

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Budget yeer 2013
Name of Zone /wereda: federal Code: 000
Name of program : Training Water Technology Technicians
Name of Sub agence: Code: 02/01/01
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2111101	6111	2,500,000.00			2,500,000.00
2	2121101	6131	275,000.00			275,000.00
3	2211102	6212	250,000.00			215,000.00
4	2211103	6213	200,000.00			100,000.00
5	2211105	6215	200,000.00			150,000.00
6	2211107	6217	650,000.00			628,332.00
7	2211108	6218	150,000.00			150,000.00
8	2221101	6231	1,200,000.00			1,581,122.00
9	2221102	6232	50,000.00			35,546.00
10	2221103	6233	80,000.00			60,000.00
11	2231101	6243	100,000.00			100,000.00
12	2231107	6241	500,000.00			500,000.00
13	2241101	6251	400,000.00			300,000.00
14	2241103	6253	50,000.00			10,000.00
15	2251101	6271	300,000.00			300,000.00
16	2311101	6313	100,000.00			100,000.00
17	2311102	6314	100,000.00			100,000.00
		ድም	7,105,000.00			7,105,000.00

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Budget yeer 2014
Name of Zone /wereda: federal Code: 000
Name of program : Training Water Technology Technicians
Name of Sub agence: Code: 02/01/01
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2111101	6111	3,030,000.00			3,030,000.00
3	2121101	6131	330,000.00			330,000.00
4	2211102	6212	300,000.00			150,000.00
5	2211103	6213	100,000.00			25,000.00
6	2211105	6215	400,000.00			200,000.00
7	2211107	6217	750,000.00			612,500.00
8	2211109	6219	150,000.00			0.00
9	2211110	6221	0.00			200,000.00
10	2221101	6231	1,850,000.00			1,957,000.00
11	2221102	6232	50,000.00			25,000.00
12	2221103	6233	10,000.00			3,000.00
13	2231107	6241	350,000.00			350,000.00
14	2241101	6251	520,000.00			50,000.00
15	2241103	6253	70,000.00			70,000.00
16	2251101	6271	350,000.00			1,257,500.00
17	2311101	6313	100,000.00			100,000.00
18	2311102	6314	140,000.00			140,000.00
		ድም	8,500,000.00			8,500,000.00

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Budget yeer 2015
Name of Zone /wereda: federal Code: 000
Name of program : Training Water Technology Technicians
Name of Sub agence: Code: 02/01/01
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2111101	6111	3,810,000.00			3,810,000.00
3	2121101	6131	420,000.00			420,000.00
4	2211102	6212	100,000.00			100,000.00
6	2211105	6215	150,000.00			115,071.00
7	2211107	6217	600,000.00			562,300.00
9	2221101	6231	1,450,000.00			930,000.00
	2231107	6241	100,000.00			100,000.00
12	2231102	6242	500,000.00			137,700.00
	2241101	6251	–		420,000.00	420,000.00
	2251101	6271	–			534,929.00
		ድምር	7,130,000.00			7,130,000.00

Total Authorized Budget By Item of Expenditure

Capital Budget Budget yeer 2011
Name of Zone /wereda: federal Code: 000
Name of program : Training Water Technology Technicians
Name of Sub agence: Code: 02/01/01/001
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2311203	6323	22,000,000.00			22,000,000.00
2	2311206	6326	800,000.00			800,000.00
		ድምር	22,800,000.00			22,800,000.00

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Capital Budget Budget yeer 2012
Name of Zone /wereda: federal Code: 000
Name of program : Teaching & Training Facilities Construction/11015001/
Name of Sub agence: Code: 02/01/01/001
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2211107	6217				930,000.00
2	2211110	6221				30,000.00
3	2231107	6241				280,000.00
4	2241101	6251				2,579,900.00
5	2241109	6259				250,000.00
6	2251101	6271				900,000.00
7	2311101	6313				4,812,050.00
8	2311102	6314				4,442,050.00
9	2211112	6251	7,104,000.00		7,104,000.00	0.00
10	2311203	6323	9,750,000.00			2,800,000.00
11	2311208	6326	300,000.00			130,000.00
		ድምር	17,154,000.00		7,104,000.00	17,154,000.00

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Capital Budget Budget yeer 2013
Name of Zone /wereda: federal Code: 000
Name of program : Teaching & Training Facilities Construction/11015001/
Name of Sub agence: Code: 02/01/01
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2211101	6211				200,000.00
2	2211108	6218				360,000.00
3	2221101	6231				378,000.00
4	2231101	6242				100,000.00
5	2231102	6243				80,000.00
6	2231107	6241				400,000.00
7	2241108	6258				150,000.00
8	2251101	6271				275,000.00
9	2311102	6314				320,000.00
10	2311203	6323	9,200,000.00			7,475,000.00
11	2311206	6326	800,000.00	261,912.00		262,000.00
		ድምር	10,000,000.00	261,912.00		10,000,000.00

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Capital Budget Budget yeer 2014
Name of Zone /wereda: federal Code: 000
Name of program : Teaching & Training Facilities Construction/11015001/
Name of Sub agence: Code: 02/01/01
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
1	2221101	6231				200,000.00
2	2231107	6217				1,200,000.00
3	2241107	6257				1,277,857.00
4	2241109	6259				90,000.00
5	2251101	6271				849,992.00
6	2311102	6314	23,000,000.00			19,382,151.00
		ድምር	23,000,000.00		–	23,000,000.00

Total Authorized Budget By Item of Expenditure

Federal Gevermment of Ethiopia Capital Budget Budget yeer 20145
Name of Zone /wereda: federal Code: 000
Name of program : Teaching & Training Facilities Construction/11015001/
Name of Sub agence: Code: 02/01/01/001
Name of public Body: Ethiopian Water Technology Institute Code: 228

N.O	Account code		Approved Budget	Budget Added	Budget Deducted	Adjusted Budget
	2311203	6323	0.00	–	–	18,800,000.00
		ድምር	–	–	–	18,800,000.00

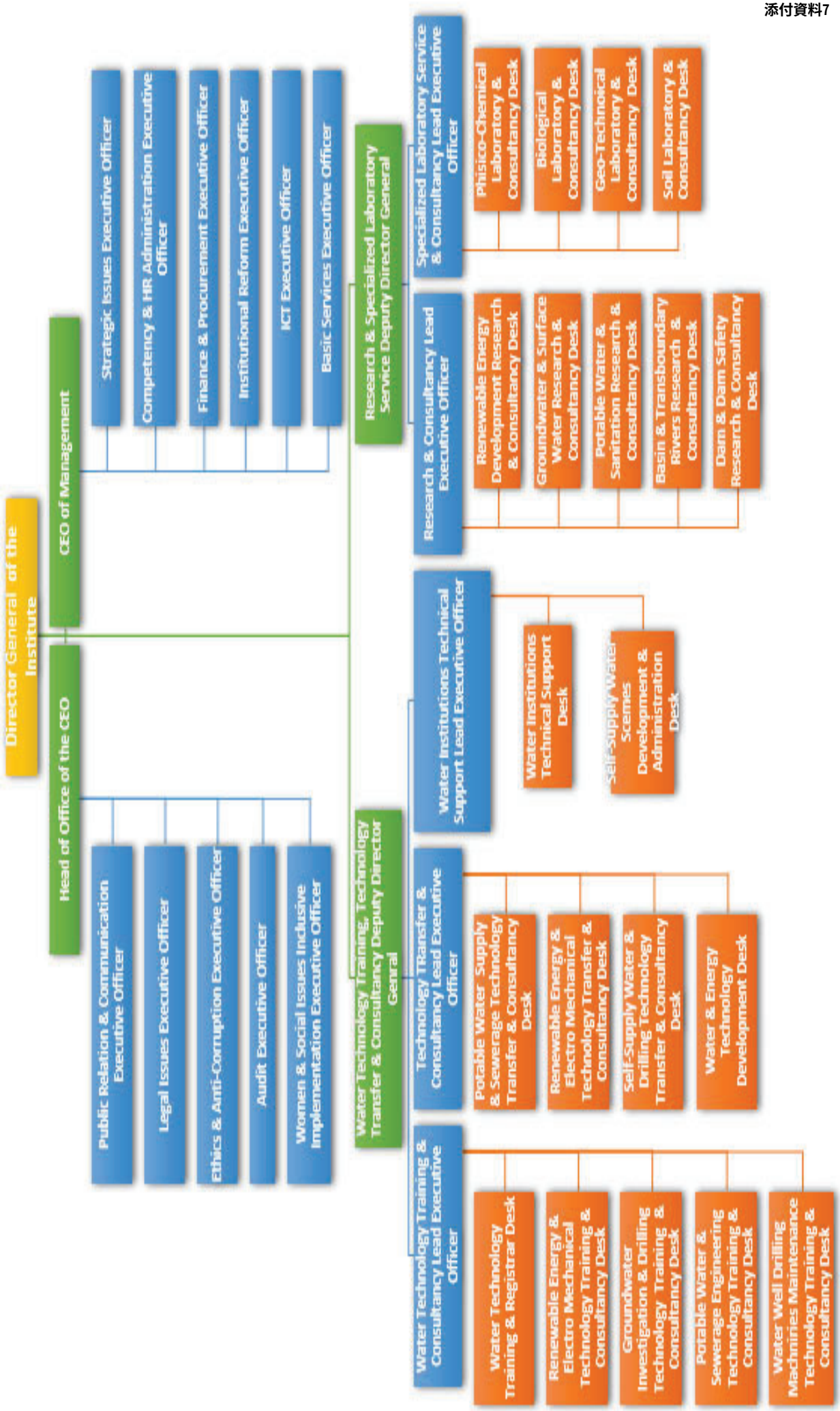
Project for Strengthening Capacity for Training Operation and Management for Ethiopian Water Technology Institute (EWTI)

Summary of the EWTI Trainers competency assessment

(1) Instructional Design and Management Competency

No	Name	Posision	Department	Assessment	Instructional Design															Management										
					Research & Analysis				Aver	Training Development				Aver	Training Delivery				Aver	KM				Aver	Activity Management				Aver	
					1	2	3	4		5	6	7	8		9	10	11	12		13	14	15	16		17	18	19	20		Average
1	Zewdu Seifu	Directore	Training Directorate	2017	2.0	2.0	3.0	2.0	2.3	2.0	3.0	1.0	1.0	1.8	2.0	3.0	1.0	2.0	2.0	4.0	3.0	2.0	3.0	3.0	3.0	2.0	2.0	2.0	2.3	2.25
				2019	4.0	3.0	5.0	3.0	3.8	4.0	4.0	2.0	3.0	3.3	3.0	4.0	2.0	2.0	2.8	5.0	4.0	2.0	2.0	3.3	4.0	4.0	2.0	3.0	3.3	3.25
				Progress	2.0	1.0	2.0	1.0	1.5	2.0	1.0	1.0	2.0	1.5	1.0	1.0	1.0	0.0	0.8	1.0	1.0	0.0	-1.0	0.3	1.0	2.0	0.0	1.0	1.0	1.00
2	Atikilt Abirha	Trainining Officer	Training Directorate	2017	1.0	1.0	2.0	3.0	1.8	3.0	2.0	3.0	2.0	2.5	4.0	4.0	3.0	3.0	3.5	4.0	3.0	4.0	1.0	3.0	2.0	2.0	2.0	3.0	2.3	2.60
				2019	3.0	4.0	4.0	3.0	3.5	4.0	4.0	4.0	3.0	3.8	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.85
				2024	3.0	4.0	4.0	3.0	3.5	4.0	4.0	4.0	3.0	3.8	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.85
				Progress	2.0	3.0	2.0	0.0	1.8	1.0	2.0	1.0	1.0	1.3	0.0	0.0	1.0	1.0	0.5	0.0	1.0	0.0	3.0	1.0	2.0	2.0	2.0	1.0	1.8	1.25
3	Endalemahu Endale	Sen. Elec. Mech.Engin	Electromechanical & Drilling Machinery Maintenance Tech. E/T/Dpt.	2017	2.0	3.0	3.0	2.0	2.5	3.0	3.0	2.0	1.0	2.3	3.0	3.0	3.0	2.0	2.8	2.0	2.0	2.0	2.0	2.0	3.0	3.0	2.0	2.0	2.5	2.40
				2019	2.0	3.0	4.0	3.0	3.0	3.0	4.0	3.0	3.0	3.3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.05
				2024	3.0	3.0	4.0	4.0	3.5	4.0	5.0	5.0	4.0	4.5	3.0	3.0	3.0	4.0	3.3	3.0	3.0	4.0	3.0	3.3	3.0	3.0	4.0	4.0	3.5	3.60
				Progress	1.0	0.0	1.0	2.0	1.0	1.0	2.0	3.0	3.0	2.3	0.0	0.0	0.0	2.0	0.5	1.0	1.0	2.0	1.0	1.3	0.0	0.0	2.0	2.0	1.0	1.20
4	Alemwork Gudu	S. Electrc. Engineer	Electromechanical & Drilling Machinery Maintenance Tech. E/T/Dept.	2017	2.0	2.0	2.0	2.0	2.0	3.0	3.0	2.0	2.0	2.5	2.0	2.0	3.0	3.0	2.5	3.0	3.0	3.0	2.0	2.8	3.0	2.0	2.0	2.0	2.3	2.40
				2019	3.0	2.0	2.0	2.0	2.0	4.0	4.0	3.0	3.0	3.5	3.0	3.0	4.0	4.0	3.5	4.0	4.0	4.0	3.0	3.8	4.0	3.0	3.0	3.0	3.3	3.25
				2024	3.0	3.0	3.0	3.0	3.0	4.0	4.0	3.0	3.0	3.5	3.0	3.0	4.0	4.0	3.5	4.0	4.0	4.0	3.0	3.8	4.0	3.0	3.0	3.0	3.3	3.40
				Progress	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.00
5	Dereje Fekade	Geologist	Water Resouce Dev. And Drilling Tech. E/T Dept.	2017	2.0	2.0	2.0	1.0	1.8	2.0	2.0	1.0	1.0	1.5	2.0	3.0	3.0	3.0	2.8	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	2.8	2.15
				2019	4.0	4.0	4.0	3.0	3.8	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.8	3.0	4.0	3.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	3.80
				2024	4.0	4.0	4.0	4.0	4.0	5.0	5.0	5.0	5.0	5.0	4.0	4.0	4.0	5.0	4.3	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.65
				Progress	2.0	2.0	2.0	3.0	2.3	3.0	3.0	4.0	4.0	3.5	2.0	1.0	1.0	2.0	1.5	3.0	3.0	3.0	3.0	3.0	3.0	2.0	2.0	2.0	2.3	2.50
6	Bizuneh Demissie	S. Drilling Technologist	Water Resouce Dev. And Drilling Tech. E/T Dept.	2017	3.0	3.0	3.0	2.0	2.8	3.0	3.0	1.0	2.0	2.3	3.0	3.0	3.0	3.0	3.0	2.0	3.0	3.0	1.0	2.3	3.0	3.0	3.0	3.0	3.0	2.65
				2019	4.0	4.0	4.0	3.0	3.8	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.8	4.0	4.0	4.0	4.0	4.0	3.90
				Progress	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	2.0	1.8	1.0	1.0	1.0	1.0	1.0	2.0	1.0	0.0	3.0	1.5	1.0	1.0	1.0	1.0	1.0	1.25
7	Gizachew Getahun	Drilling WS Attendant /Mechanical Eng.	Water Resouce Dev. And Drilling Tech. E/T Dept.	2017	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0	2.0	1.8	2.0	2.0	2.0	2.0	2.0	3.0	2.0	1.0	1.0	1.8	2.0	2.0	1.0	2.0	1.8	1.85
				2019	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0	3.8	4.0	4.0	3.0	3.0	3.5	4.0	4.0	3.0	4.0	3.8	3.80
				2024	5.0	4.5	5.0	5.0	4.9	5.0	5.0	5.0	4.5	4.9	5.0	5.0	4.5	5.0	4.9	4.0	5.0	4.0	4.0	4.3	5.0	5.0	4.0	4.0	4.5	4.68
				Progress	3.0	2.5	3.0	3.0	2.9	3.0	3.0	4.0	2.5	3.1	3.0	3.0	2.5	3.0	2.9	1.0	3.0	3.0	3.0	2.5	3.0	3.0	3.0	2.0	2.8	2.83
8	Wondimagegn Admas	Technical Assistant /Hydraulic Eng.	Water Supply and Sewerage E/T Dept.	2017	2.0	3.0	3.0	3.0	2.8	4.0	2.0	2.0	3.0	2.8	3.0	3.0	3.0	3.0	3.0	4.0	3.0	3.0	3.0	3.3	3.0	2.0	2.0	2.0	2.3	2.80
				2019	3.0	4.0	4.0	4.0	3.8	4.0	4.0	3.0	3.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.3	3.70
				2024	3.0	4.0	4.0	4.0	3.8	4.0	4.0	3.0	3.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0	3.0	3.0	3.3	3.70
				Progress	1.0	1.0	1.0	1.0	1.0	0.0	2.0	1.0	0.0	0.8	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	0.8	1.0	1.0	1.0	1.0	1.0	0.90
9	Habtamu Tesfaye	Construction Management	Water Supply and Sewerage E/T Dept.	2017	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	2.0	3.0	2.0	2.5	3.5	2.0	2.0	2.0	2.4	3.0	3.0	3.0	3.0	3.0	2.38
				2019	3.5	3.5	3.5	3.5	3.5	4.0	4.5	3.5	4.0	4.0	4.5	4.0	4.0	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.5	4.5	4.0	4.0	4.3	3.95
				2024	4.0	4.0	4.5	4.0	4.1	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.4	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.40
				Progress	2.0	2.0	2.5	2.0	2.1	2.5	2.5	2.5	2.5	2.5	1.5	2.5	1.5	2.0	1.9	1.0	2.5	2.5	2.5	2.1	1.5	1.5	1.5	1.5	1.5	2.03
Average				2017	2.0	2.2	2.4	2.1	2.2	2.7	2.4	1.7	1.8	2.1	2.7	2.8	2.7	2.6	2.7	3.1	2.6	2.4	1.9	2.5	2.7	2.4	2.2	2.4	2.4	2.39
				2019	3.4	3.5	3.8	3.2	3.5	3.9	4.1	3.4	3.4	3.7	3.6	3.8	3.7	3.5	3.6	3.9	3.9	3.3	3.4	3.6	3.9	3.7	3.3	3.6	3.6	3.62
				2024	3.7	3.7	4.2	3.7	3.8	4.3	4.4	3.9	3.8	4.1	3.8	3.9	3.8	4.0	3.9	4.2	4.2	3.8	3.7	4.0	4.2	3.9	3.7	3.8	3.9	3.94
				Progress	1.7	1.5	1.7	1.6	1.6	1.6	1.9	2.3	2.0	2.0	1.2	1.2	1.1	1.4	1.2	1.1	1.6	1.4	1.8	1.5	1.5	1.5	1.5	1.4	1.5	1.55

*The average calculation was done using the same figures of 2019, for those who did not exist in the year 2014.


Director General of the Institute
CEO of Management
Head of Office of the CEO
Strategic Issues Executive Officer
Competency & HR Administration Executive Officer
Finance & Procurement Executive Officer
Institutional Reform Executive Officer
ICT Executive Officer
Basic Services Executive Officer
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Phisico-Chemical Laboratory & Consultancy Desk
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Geo-Technical Laboratory & Consultancy Desk
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Potable Water & Sanitation Research & Consultancy Desk
Basin & Transboundary Rivers Research & Consultancy Desk
Dam & Dam Safety Research & Consultancy Desk
Water Technology Training, Technology Transfer & Consultancy Deputy Director Genral
Water Institutions Technical Support Lead Executive Officer
Water Institutions Technical Support Desk
Self-Supply Water Scemes Development & Administration Desk
Technology TRansfer & Consultancy Lead Executive Officer
Potable Water Supply & Sewerage Technology Transfer & Consultancy Desk
Renewable Energy & Electro Mechanical Technology Transfer & Consultancy Desk
Self-Supply Water & Drilling Technology Transfer & Consultancy Desk
Water & Energy Technology Development Desk
Water Technology Training & Consultancy Lead Executive Officer
Water Technology Training & Registrar Desk
Renewable Energy & Electro Mechanical Technology Training & Consultancy Desk
Groundwater Investigation & Drilling Technology Training & Consultancy Desk
Potable Water & Sewerage Engineering Technology Training & Consultancy Desk
Water Well Drilling Machinies Maintenance Technology Training & Consultancy Desk

Ethiopian Water Technology Institute (EWTI)
Japan International Cooperation Agency (JICA)

Project for Strengthening Capacity for Training Operation and Management of EWTI

Report on Technical Gap Survey

December 2017

Contents

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Abbreviations

DEM	Digital Elevation Model
DMMT	Drilling Machinery Maintenance Technology
DT	Drilling Technology
DTH	Down The Hole
ECM	Electronics Control Module
EFI	Electronic Fuel Injection
EMMT	Electro-Mechanical Maintenance Technology
EM&DMM	Electro-Mechanical and Drilling Machinery Maintenance Technology
EWTEC	Ethiopian Water Technology Center
EWTI	Ethiopian Water Technology Institute
GI	Groundwater Investigation
GTP	Growth and Transformation Plan
JICA	Japan International Cooperation Agency
NGO	Non-Governmental Organization
PDCA	Plan-Do-Check-Act
PLC	Programmable Logic Control
RWB	Regional Water Bureau
SCADA	Supervisory Control and Data Acquisition
SNNP	Southern Nations, Nationality, and Peoples Region
TDEM	Time Domain Electromagnetic Method
TGS	Technical Gap Survey
THD	Top Head Drive
TNA	Training Needs Assessment
TVETC	Technical Vocational Education and Training College
TWS	Town Water Service
UAP	Universal Access Program
VES	Vertical Electrical Sounding
WRD&DT	Water Resource Development and Drilling Technology
WWCE	Water Works Construction Enterprise
WWDE	Water Well Drilling Enterprise
WWDSE	Water Works Design and Supervision Enterprise
ZWO	Zonal Water Office

1 Introduction

1.1 Background

In Ethiopia one of the major sources of water supply is groundwater, which the country is believed to have a reasonably rich potential. Unfortunately, development of water resources and water supply coverage in the country are quite insufficient compared to the world standard. Therefore, the development and improvement of water resources, both in quality and quantity for water supply service is given prime attention in Growth and Transformation Plan II (GTP II).

UAP (Universal Access Program), a national WASH development plan indicated that one of the serious obstacles for the development of water resources and water supply services is a shortage of trained technical personnel in water sector. Therefore, in order to be more responsive to the prevailing higher demand in terms of building the capacity of the existing human resources working in the sector as well as to play a key role to support water TVETCs, the former Ethiopian Water Technology Center, EWTEC was transformed into an autonomous public institution being legally established as Ethiopian Water Technology Institute, EWTI by Council of Ministers Regulation No. 295/2013 as of August 06, 2013.

However, EWTI faces difficulty to secure competent staff to implement practical and needs-based short-term training. Although EWTI is striving for recruiting new qualified staff and most of the lecturer's positions are filled, their practical skills are still needed to be strengthened in order to meet the expected proficiency. Moreover, to develop the training courses matching with the existing needs and to implement them effectively and sustainably, more systematic management of training operation is necessary. In response to this situation, the Ethiopian government requested to the Japanese government to strengthen EWTI's training operation and management capacity with sustainability. Accordingly, a project entitled “Project for Strengthening Capacity for Training Operation and Management of EWTI” (hereinafter the Project) was initiated with the technical support by Japan International Cooperation Agency, JICA in June 2017.

The Project focuses on strengthening of training management with PDCA (Plan-Do-Check-Act) cycle as well as developing the technical capacity of EWTI trainers. Currently, EWTI is conducting many training courses related to groundwater investigation, drilling technology, drilling machinery maintenance technology and electro-mechanical maintenance technology etc., most of them are continuation of the same training courses since EWTEC period. However, the demands of the market are changing and EWTI may not be providing appropriate contents of training. The results of Training Needs Assessment (TNA) conducted by EWTI in early 2017 prior to the Project indicated requirement of more specific and more practical training courses rather than those covering large topics as is the case of current EWTI training courses. It is time for EWTI to reorganize training courses to meet the diversified demands in the actual working places.

Therefore, this technical gap survey (TGS) was implemented during the initial phase of the Project as a part of planning activities. “Technical gap” in this survey means prevailing gaps between the

required skills and actual skills of engineers/technicians in the water sector to accomplish the tasks needed in the working places of each organization.

Main actors of the survey are EWTI trainers during the all stages of the survey such as planning, preparation of questionnaires, field work, analysis and reporting as capacity development.

1.2 Objectives of the survey

This survey has the following three objectives.

- To identify technical gap and priority subjects to be strengthened in the target organizations for future planning of EWTI training courses
- To obtain baseline data to monitor and evaluate the effectiveness of EWTI training courses focused in the Project
- To develop the capacity of EWTI trainers for the planning, implementation and analysis of the survey as a part of PDCA cycle.

1.3 Scope of work

The survey covers four major training areas such as Groundwater Investigation (GI), Drilling Technology (DT), Drilling Machinery Maintenance Technology (DMMT) and Electro-Mechanical Maintenance Technology (EMMT). The total number of organizations covered by the survey is 39 and the total number of samples collected by the survey is 159.

Target regions of the survey are Addis Ababa, Oromia, Amhara, Tigray, SNNP and Benishangul- Gumuz. The first five major regions were selected as per the agreement between JICA and EWTI and the last one was added to have the view of one of the regions which needs special support.

Organization	Number of Organizations	Number of respondents				
		GI	DT	DMMT	EMMT	Total
Regional Water Bureau (RWB)	4	12	0	3	9	24
Zonal Water Office (ZWO)	7	5	0	0	11	16
Woreda Water Office (WWO)	11	0	0	0	19	19
Water Works Construction Enterprise (WWCE)	3	9	16	8	0	33
Water Well Drilling Enterprise (WWDE)	2	9	8	12	0	29
Water Works Design and Supervision Enterprise (WWDSE)	3	11	0	0	0	11
Town Water Service (TWS)	7	0	0	0	19	19
Private Company	1	1	2	1	0	4
Irrigation Project Office	1	0	0	0	4	4
Total	**39**	**47**	**26**	**24**	**62**	**159**

2 Methodology

2.1 Survey tools

The survey team applied the use of the following five survey tools for collection of data.

- Questionnaire A
- Questionnaire B
- Direct interview (Checklist)
- Group discussion
- Interview to Manager/Supervisor

Questionnaire A and B (combined in one sheet)

The survey team used two types of self-evaluation questioners to collect data from employees working in job areas related to the above-mentioned four training areas. Questioner A focuses on “frequency of work engagement” and Questionnaire B is focuses on “technical gap” of employees on the listed activities or tasks. With the use of these prepared self-evaluation questioners the target experts/technicians were asked by providing a range of sub-tasks to identify their most engaged work areas (Questionnaire A) as well as the specific areas where they lack in skills while performing his/her assigned job (Questionnaire B). These two questionnaires are not the separate sheets but combined in one sheet so that respondents can answer to the question A and B for the same task. Questionnaire sheets are attached in Annex 1.

Direct interview (Checklist)

The survey team with the aid of Checklist interviewed directly the target employees in order to evaluate and justify the results of self-evaluation answered through Questionnaire A and B, and moreover to prove in depth their skill levels on the specified tasks related to their assigned job. Checklist is attached in Annex 2.

Group discussion

The survey team conducted group discussion with the target experts/technicians to identify specific skill problems that could not be covered or missed in the questioner and also tried to identify problems other than technical gap that negatively affects the work performance. Guiding notes for the group discussion is attached in Annex 3.

Interview to Manager/Supervisor

The survey team conducted interview to the management staff regarding the performance situation of employees working in the four target areas of profession in the target organizations. Supervisors are requested to confirm the responses given to the questionnaires by their subordinates/employees as well as to give comments to improve the skill level of their employees. Interview guides are attached in

Annex 4.

The required information, the methodology applied to collect the information, the activities carried out by the survey teams and the expected outputs of each activity are summarized in the table below.

Required information	Survey methods	Activities	Expected outputs
Identified list of specific tasks by frequency of engagement and the technical gap or level of performance of the target experts/technicians	Self-evaluation (Questionnaire A and Questionnaire B)	Managers/ supervisors were consulted to select the right target experts or employees and questionnaires distributed to the selected targets and the survey team assisted them by explaining any unclear points to respond to the questionnaire.	To identify most engaged work areas of target employees and specific areas lacking in skill to perform the assigned job.
More concrete skill level information through in-depth probing of target employees	Direct interview (Checklist)	With the aid of the check list the survey team conducted direct interview for in-depth probing so as to identify more concretely the skill level of the target technicians/experts	To justify the results of Questionnaire A and B and to identify skill level of target employees for specific task areas on a more concrete level.
Confirmation of information obtained through questionnaire and interview as well as to get information if there are problems other than technical gap that contribute to low performance.	Group discussion (Discussion points)	Target respondents for each technical field in an organization are gathered in one place and discussion was made based on the prepared discussion guide.	To identify problems other than technical gap that negatively affects performance.
Expected tasks to be performed by target experts/technicians and the corresponding level of achievement	Managerial interview (Interview guide questioner)	With the aid of interview guide questioner, the survey team conducted interview to managers /supervisors of target experts/technicians to get major duties of the target experts/ technicians and to review job descriptions to get ideas of the tasks performed by target experts/technicians. The managers/supervisors are asked what duties performed well and not performed satisfactorily by the target experts/technicians.	To identify the list of tasks/duties satisfactorily accomplished and not accomplished by the experts/technicians.

		Survey team requested the list of technical staff and corresponding job description to the head of organization by explaining the reason of the requested data.	Collected list of technical staff and job description.

Even though all the survey tools applied in this technical gap survey are important, the data gathered through the direct interview with the aid of Checklist is considered most reliable as it is probed much in-depth to detect the skill level of the target respondents. However, the information or data collected through the other survey tools such as questionnaire A and B (self-evaluation) as well as results of group discussion and managerial/supervisor interview were fully used to check and re-confirm the results obtained through direct interview/checklist.

2.2 Sampling method

The survey groups applied accidental or convenient sampling method (due to security reason and survey time limitation) for selecting sample organizations where the survey data was collected.

2.3 Survey schedule and survey group

There were four survey groups formed according to the technical fields mentioned above. Survey schedule of each group is as follows.

September 21-22, 2017

GI/DT/DMMT Group A: Tamiru, Samuel, Mengesha, Melaku	**GI/DT/DMMT Group B:** Bizuneh, Dereje, Zemenu, Alemayehu
EMMT Group A: Endalemahu, Atkilt, Lolo	**EMMT Group B:** Alemwork, Gutema, Habtamu, Nugussie

1st week Addis Ababa - Oromia

Place	GI	DT	DMMT	EMMT
	Institution			
Addis Ababa	Oromia WWDE	Oromia WWDE	Oromia WWDE	Oromia Akaki WWO
	Derba Drilling	Derba Drilling	Derba Drilling	

September 23-30, 2017

GI/DT/DMMT Group B: Bizuneh, Dereje, Zemenu, Alemayehu

Phase 1 Tigray

Place	GI	DT	DMMT	Schedule
	Institution			
Mekele	Tigray RWB	Tigray WWCE	Tigray WWCE	September 23 -30, 2017
	Tigray WWCE			
	Tigray WWDSE			

September 23-30, 2017

EMMT Group A:
Endalemahu, Atkilt, Daniel, Lolo

Phase 1 Tigray

Place	EMMT Institutuion	Schedule
Mekele	Tigray RWB	Sept.23-30,2017
	Enderta WWO	
Alamata	Alamata WWO	
Mekele	Mekele TWS	

September 23-30, 2017

EMMT Group B:
Alemwork, Gutema, Habtamu, Nugussie

Phase 1 Benshangul-Oromia

Place	EMMT Institutuion	Schedule
Assosa	Benshangul RWB	Sept.23-30, 2017
	Assosa WWO	
	Assosa TWS	
Nekemte	East Wollega ZWO	
	Nekemte TWS	

October 01 - 08, 2017

GI/DT/DMMT Group B:
Bizuneh, Dereje, Zeman, Alemayahu

Phase 2 Amhara

Place	GI	DT	DMMT	Schedule
	Institution			
Bahir Dar	Amhara RWB	SNNPR WWDE	SNNPR WWDE	Oct.01-08, 2017
	Amhara WWDE	SNNPR RWB	SNNPR RWB	
	Amhara WWDSE			
Debre Markos	East Gojam ZWO			

October 01 - 08, 2017

EMMT Group A:
Endalemahu, Atkilt, Daniel, Lolo

Phase 2 Amhara - Tigray

Place	EMMT Institutuion	Schedule
Alamata	Alamata WWO	Octo.01-08, 2017
	Alamata TWS	
Dessie	South Well ZWO	
	Dessie TWS	
Haik	Haik WWO	
?	Borena WWO	
?	Kelela WWO	
?	Legambo WWO	
?	Saint WWO	
Debre Berhan	North Shoa ZWO	
	Debre Berhan TWS	
Kobo	Irrigation Project	

October 01 - 08, 2017

EMMT Group B:
Alemwork, Gutema, Habtamu, Nugussie

Phase 2 SNNPR

Place	EMMT Institutuion	Schedule
Hawassa	SNNPR RWB	Oct.01-08, 2017
	Sidama ZWO	
	Hawassa TWS	
Wolkite	Gurage ZWO	
	Habsque WWO	
	Kebena WWO	
	Wolkite TWS	

3 Findings and analysis

3.1 Groundwater investigation (GI)

3.1.1 Target of survey

(1) Target organizations

The major organizations which conduct activities related to groundwater investigation are Regional Water Bureaus (RWB), Zonal Water Office (ZWO), Water Works Construction Enterprises (WWCE), Water Well Drilling Enterprises (WWDE), Water Works Design and Supervision Enterprises (WWDSE) and Private Company. In this survey, those offices in Benishangul-Gumuz, SNNP, Oromia, Amhara, Tigray regions and Addis Ababa are visited.

Table 1: Target organizations for Groundwater Investigation

Organizations	Region	No of organizations	No. of respondents
RWB	SNNP, Tigray, Amhara and Benishangul-Gumuz	4	12
ZWO	SNNP, Amhara and Benishangul-Gumuz	3	5
WWCE	SNNP, Tigray and Benishangul-Gumuz	3	9
WWDE	Oromia, Amhara	2	9
WWDSE	SNNP, Tigray and Amhara	3	11
Private Company	Addis Ababa	1	1
Total		16	47

(2) Target respondents

The target professionals of the survey are mainly hydrogeologists engaged in groundwater study, development and management activities in the above mentioned organizations. The total number of respondents is 47.

3.1.2 Frequency of activities respondents mostly engaged (Questionnaire A)

Major technical tasks regarding groundwater investigation are listed in Table 2. Engagement in these tasks was answered by the respondents using Questionnaire A.

Table 2: Technical tasks described in the questionnaire for Groundwater Investigation

Category	Contents
Groundwater Hydrology	Hydro metrology data acquisition, analysis and interpretation
	Estimate evapotranspiration
	Rainfall-runoff relationships
	Calculate river flow discharge
	Performing catchment water balance analysis

Category	Contents
	Hydrograph separation (base flow recession)
	Estimation of groundwater recharge
	Estimation infiltration, percolation and storage
	Conduct the residence time /Isotope hydrology/
Groundwater Investigation	Preliminary data acquisition, analysis and interpretation
	Topographic map analysis and interpretation (how topography influence groundwater occurrence)
	Analysis and interpretation of Digital Elevation Model (DEM)
	Perform physiography analysis (soil, vegetation cover, relief etc.)
	Determine drainage pattern relationship with geology and its influence of groundwater occurrence
	Preparation of geo-hydrochemical maps that indicate the chemical characteristics of groundwater
	Preparation of geological maps, correlation of stratigraphy, interpretation geology in terms of groundwater potential
	Identification and mapping of potential groundwater areas (hydrogeological mapping) with groundwater flow direction
	Analyses interpret regional and local hydrodynamics of groundwater flow, identify deep aquifer
	Collect remote sensing data (satellite images, aerial photographs) analysis and interpret
	Perform fracture trace analysis and determine fractures hydrogeological characteristics
Surface Geophysics	Perform hydro-geophysical mapping;
	Geophysical well field delineation borehole mapping and geo-pollution studies;
	Conducting Vertical Electrical Sounding (VES) measurement by Schlumberger arrays.
	Interpretation using curve matching and/or inversion to assess thickness of the subsurface layers changes in lithology and depth to water table.
	Estimate depth of water well drilling.
	Conducting profiling measurement by different array (Wenner, Schlumberger etc. array). And assess lateral changes in subsurface condition at a constant dimension of potential and current electrode).
	Writing Geophysical report for profiling and sounding survey
	Conduct 2D electrical imaging surveys.
	Performing pseudo section data plotting using Pseudo section contouring method
	Calculate the apparent resistivity Pseudo section for a user defined 2-D subsurface model using software program RES2DMOD.EXE.
	Writing Geophysical report for electrical imaging surveys.
	Conducting measurement of conductivity of the subsurface in Time domain electromagnetic (TDEM) with a receiver and transmitter unit.
	Interpretation method for determination of thickness and conductivity of subsurface rock using TDEM method
	Writing Geophysical report for Time domain electromagnetic (TDEM) method.
Borehole Geophysics	Conduct logging such as resistivity log, Caliper log, spontaneous potential log, gamma-gamma log
	Perform data processing and interpretation of geophysical logging
Geochemistry	Collect water samples, analysis and interpret characteristics of water (physical, chemical and biological using software)

Category	Contents	
	Determine quality of water for different uses (agricultural, domestic, industrial etc.)	
	Performing groundwater quality mapping	
	Applying of water quality standard and use	
	Define controlling factors of evolution of water chemistry	
	Determine groundwater flow direction from geochemistry/ Isotope hydrology	
Water Well Management	Drilling Technology	Identify drilling machineries
		Determine drilling technics in different geologic formation
		Explain purpose of rotary drilling techniques advantage and disadvantage (Air Rotary Drilling Method, Mud Rotary Drilling Method, Down the Hole (DTH) Drilling) • Direct Rotary Techniques (direct circulation) • Reveres Rotary Techniques (reverse circulation)
		Decide drilling bit types and function (percussion, rotary, DTH bits)
		Identify and application of Drilling Fluids used in drilling (Clear water, Compressed air, Foam, Water based mud)
		Perform formation sampling, geological logging, geophysical logging
		Perform well design
		Identify functions of different kinds of casing and installation
		Explain gravel packing, well head construction and and cement grouting
	Drilling Supervision	Supervise water well drilling supervision sequence of the work
		Supervise well construction procedures
		Applying professional ethics
	Contract Administration	Identify types of Contracts, Basic Components of Contract Agreement
		Relations Among the Different Parties
		Explain, understand and relate laws and policies (the water policy, the health and sanitation policy, Environmental policy, Construction works policy, Science and Technology policy etc.)
		The Standard Condition of Contracts
		Bidding Procedures, Evaluation of Proposals
	Well Rehabilitation	Supervise well rehabilitation and maintenance
		Determine redevelopment with well-development techniques. • Mechanical Rehabilitation Brushing Surge blocks, High-Velocity Jetting • Chemical Rehabilitation Acid Treatment Chlorine, Hypo chlorites (Ocl), Acid Treatment, hydrochloric (HCI), sulfamic (NH2SO3H), hydroxyacetic (HOCF12COOH). • Structural repairs Deepening the well
Pumping test	Know basic principles of pumping test method	
	Conduct provisional, step draw down, constant discharge and recovery pumping test method	
	Collect pumping test data, analysis and interpret	
	Calculate hydraulic property of aquifer and well efficiency	
	Identify aquifer type, yield	
	Determine/ decide pump position in the well	
	Conduct basin pumping test	
	Estimation of basin discharge	

Category	Contents
	Determine ground water flow direction
Groundwater Modeling	Understand basic groundwater modelling
	Plan and make outline of modeling
	Collect and prepare data for modeling
	Design model framework
	Input data and performing simulation
	Perform model calibration
	Demonstrate the result and applications
	Writing report of Modeling

The result of Questionnaire A is summarized in Figure 1 and results of each task are shown in Figure 2.

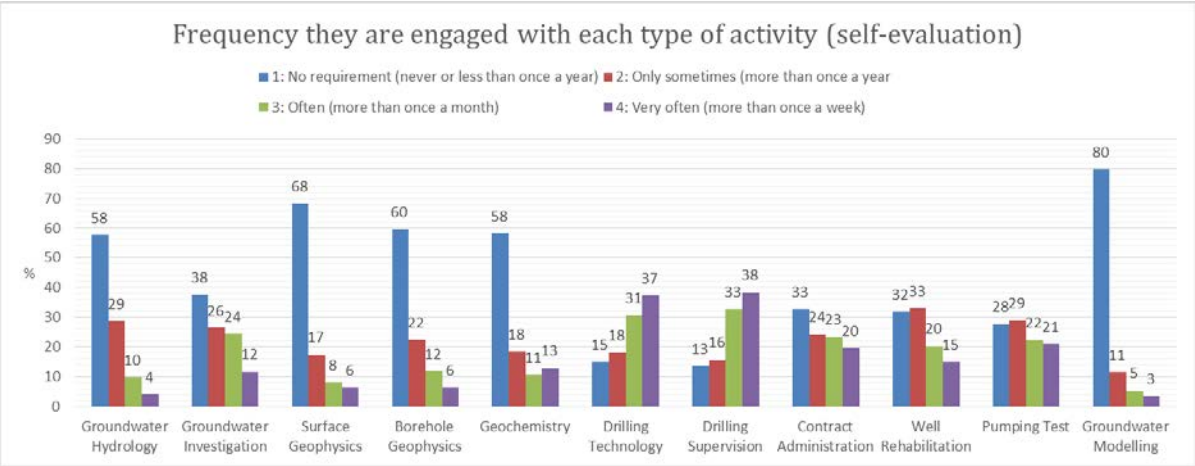
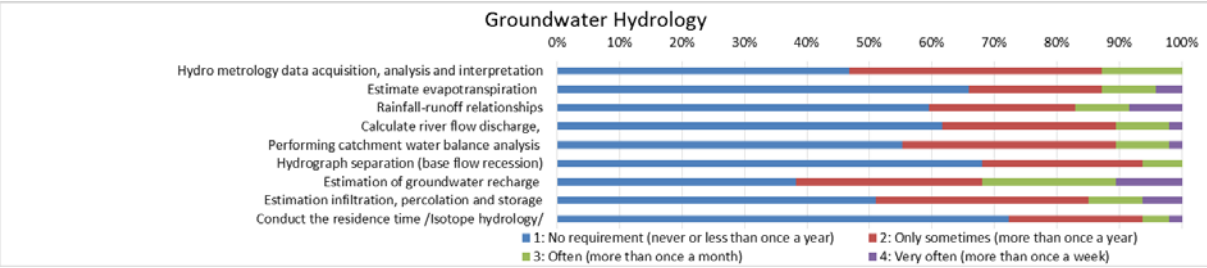
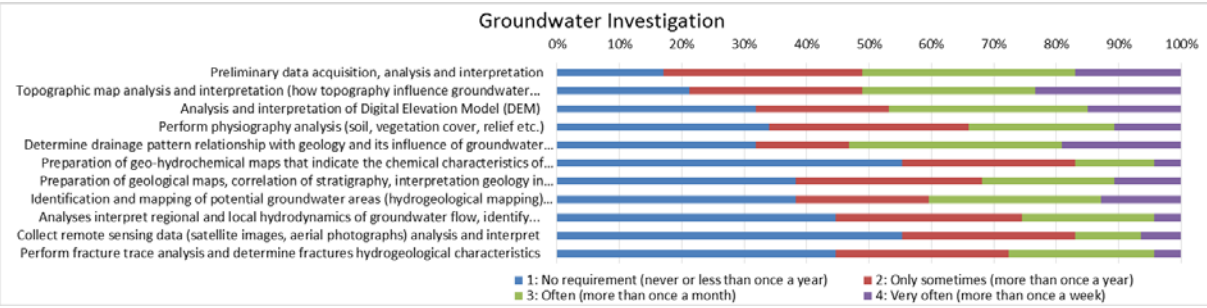
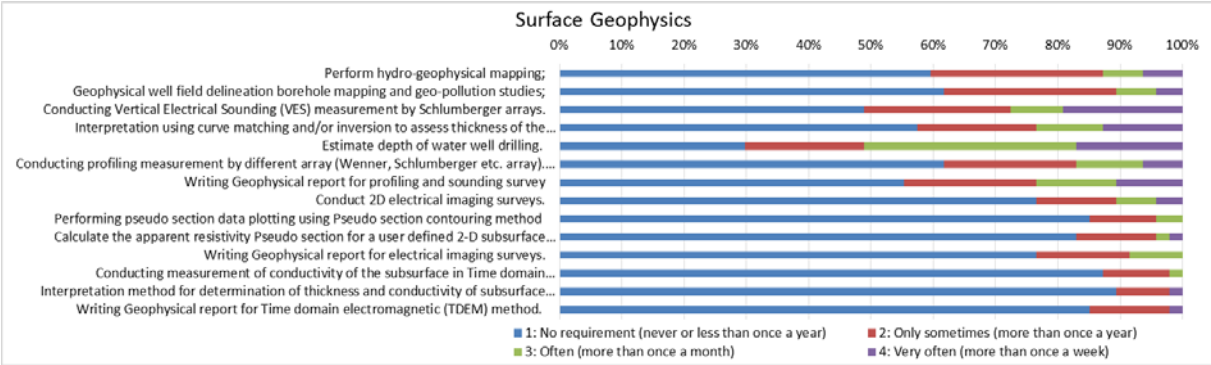
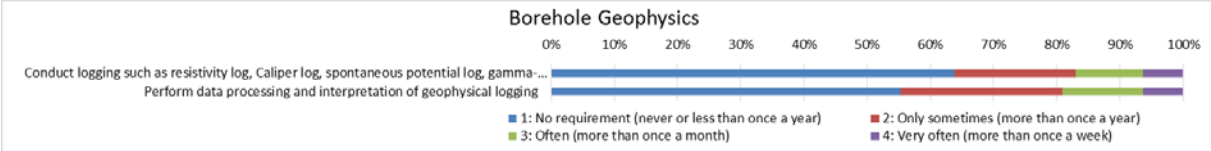


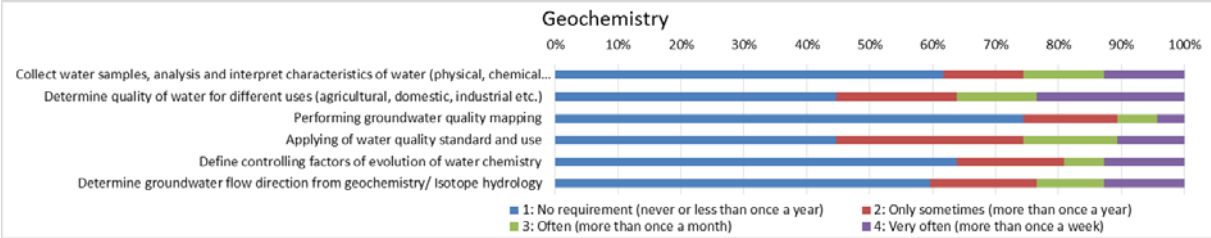
Figure 1: Summary of Questionnaire A for Groundwater Investigation

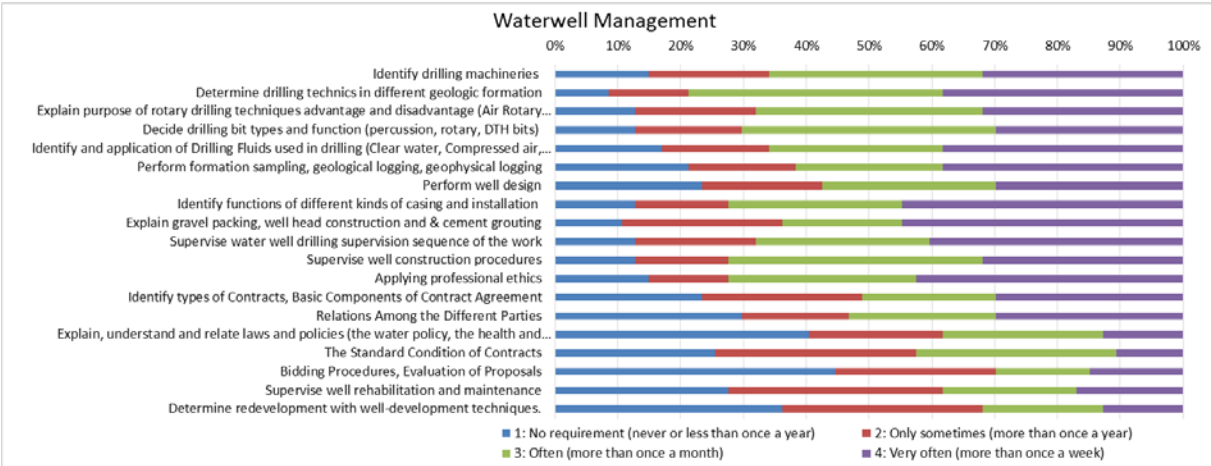


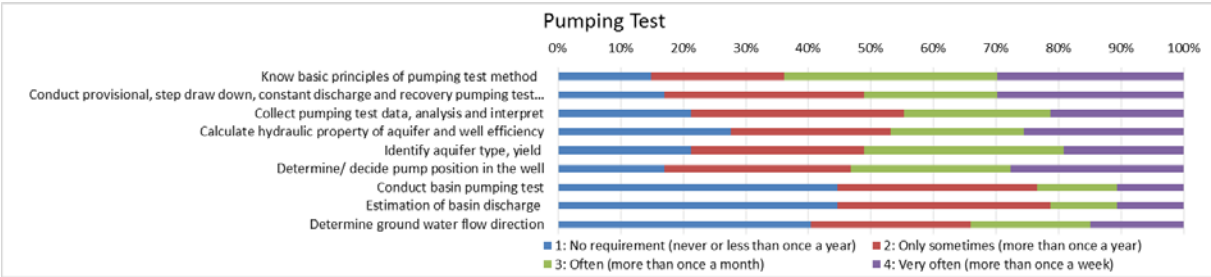



Surface Geophysics
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Perform hydro-geophysical mapping;
Geophysical well field delineation borehole mapping and geo-pollution studies;
Conducting Vertical Electrical Sounding (VES) measurement by Schlumberger arrays.
Interpretation using curve matching and/or inversion to assess thickness of the...
Estimate depth of water well drilling.
Conducting profiling measurement by different array (Wenner, Schlumberger etc. array)....
Writing Geophysical report for profiling and sounding survey
Conduct 2D electrical imaging surveys.
Performing pseudo section data plotting using Pseudo section contouring method
Calculate the apparent resistivity Pseudo section for a user defined 2-D subsurface...
Writing Geophysical report for electrical imaging surveys.
Conducting measurement of conductivity of the subsurface in Time domain...
Interpretation method for determination of thickness and conductivity of subsurface...
Writing Geophysical report for Time domain electromagnetic (TDEM) method.
1: No requirement (never or less than once a year)
2: Only sometimes (more than once a year)
3: Often (more than once a month)
4: Very often (more than once a week)


Borehole Geophysics
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Conduct logging such as resistivity log, Caliper log, spontaneous potential log, gamma-...
Perform data processing and interpretation of geophysical logging
1: No requirement (never or less than once a year)
2: Only sometimes (more than once a year)
3: Often (more than once a month)
4: Very often (more than once a week)


Geochemistry
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Collect water samples, analysis and interpret characteristics of water (physical, chemical...
Determine quality of water for different uses (agricultural, domestic, industrial etc.)
Performing groundwater quality mapping
Applying of water quality standard and use
Define controlling factors of evolution of water chemistry
Determine groundwater flow direction from geochemistry/ Isotope hydrology
1: No requirement (never or less than once a year)
2: Only sometimes (more than once a year)
3: Often (more than once a month)
4: Very often (more than once a week)


Waterwell Management
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Identify drilling machineries
Determine drilling technics in different geologic formation
Explain purpose of rotary drilling techniques advantage and disadvantage (Air Rotary...
Decide drilling bit types and function (percussion, rotary, DTH bits)
Identify and application of Drilling Fluids used in drilling (Clear water, Compressed air,...
Perform formation sampling, geological logging, geophysical logging
Perform well design
Identify functions of different kinds of casing and installation
Explain gravel packing, well head construction and & cement grouting
Supervise water well drilling supervision sequence of the work
Supervise well construction procedures
Applying professional ethics
Identify types of Contracts, Basic Components of Contract Agreement
Relations Among the Different Parties
Explain, understand and relate laws and policies (the water policy, the health and...
The Standard Condition of Contracts
Bidding Procedures, Evaluation of Proposals
Supervise well rehabilitation and maintenance
Determine redevelopment with well-development techniques.
1: No requirement (never or less than once a year)
2: Only sometimes (more than once a year)
3: Often (more than once a month)
4: Very often (more than once a week)


Pumping Test
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Know basic principles of pumping test method
Conduct provisional, step draw down, constant discharge and recovery pumping test...
Collect pumping test data, analysis and interpret
Calculate hydraulic property of aquifer and well efficiency
Identify aquifer type, yield
Determine/ decide pump position in the well
Conduct basin pumping test
Estimation of basin discharge
Determine ground water flow direction
1: No requirement (never or less than once a year)
2: Only sometimes (more than once a year)
3: Often (more than once a month)
4: Very often (more than once a week)

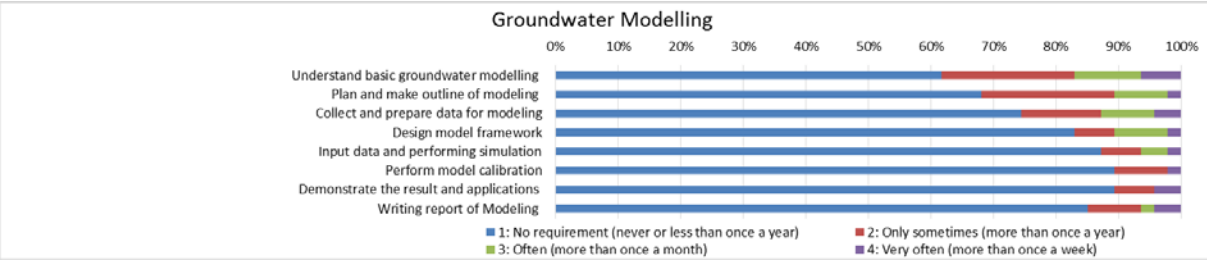


Figure 2: Frequency of activities which respondents are engaged with in their daily work related to Groundwater Investigation

The result of the survey shows that most of the respondents are frequently involved in drilling supervision, drilling technology, contract administration, pumping test, water well rehabilitation, which are drilling related activities. In addition, engagement with groundwater investigation is also relatively high.

On the other hand, majority of respondents are very less engaged in groundwater modelling. This is because skill and knowledge in this field is very low and also availability of observation well data does not exist in each region. Similarly, very few of respondents are involved in surface and borehole geophysics, due to lack of instruments and low level of skill and knowledge in the activities.

However, if it is analyzed organization-wise, WWDSE shows relatively high involvement in geophysical survey and groundwater modeling. WWDE and WWCE show relatively high involvement in borehole logging.

The survey result shows almost half of the respondents are not involved in geochemistry although it is critically important to decide its portability. This task is considered less practiced due to low level of awareness or low level of skill and knowledge.

3.1.3 Level of practical skills of respondents (Questionnaire B)

To assess the level of practical skill, Questionnaire B was filled by respondents. The tasks described in Questionnaire B are the same as those in Table 1. The result of Questionnaire B is summarized in Figure 3 and results of each task are shown in Figure 2.

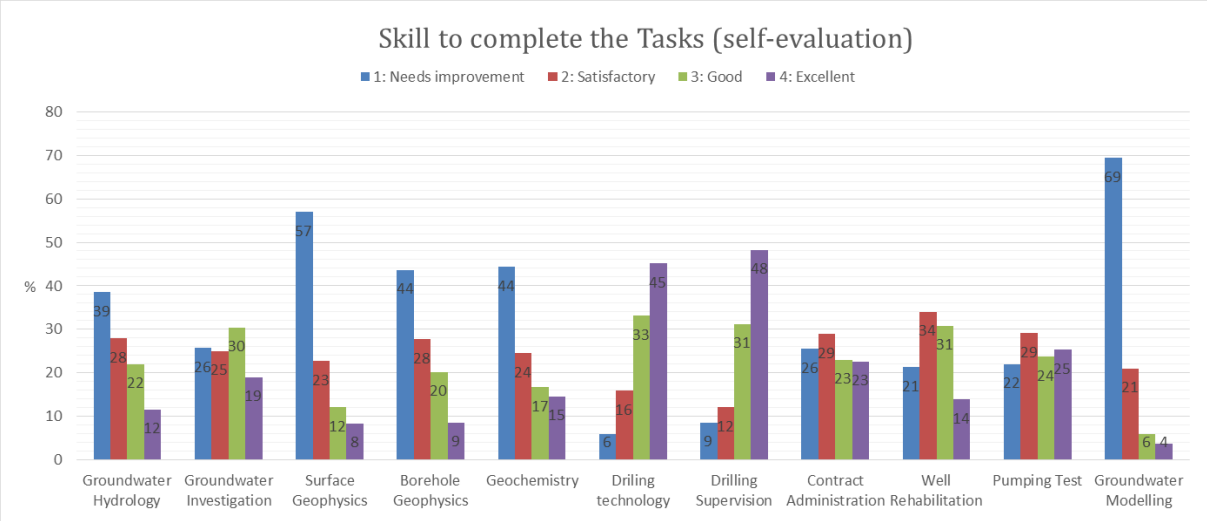
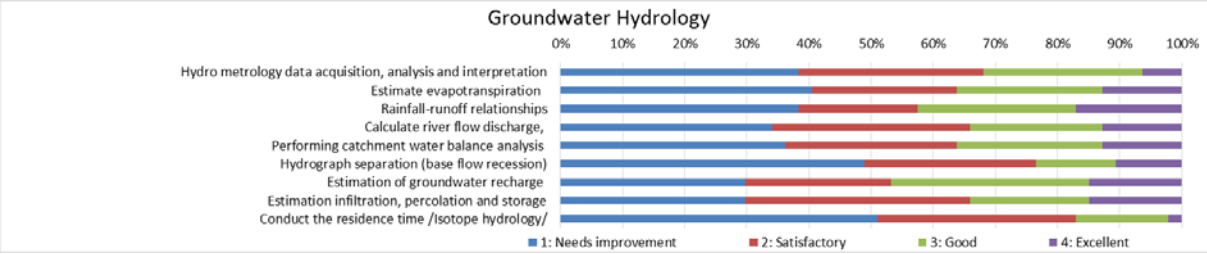
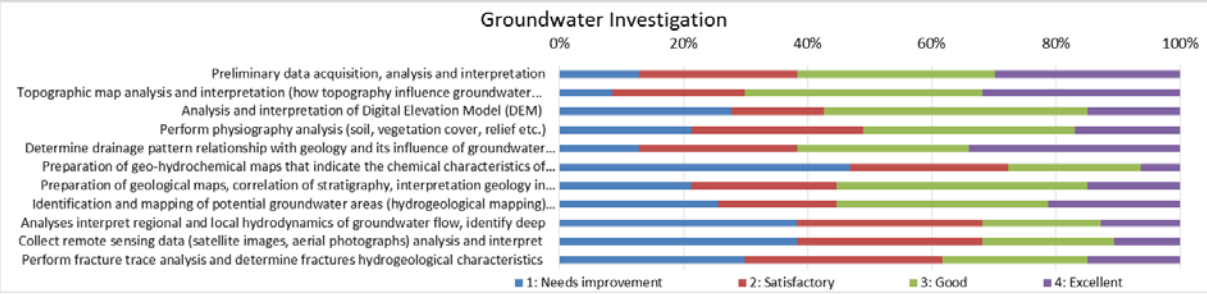
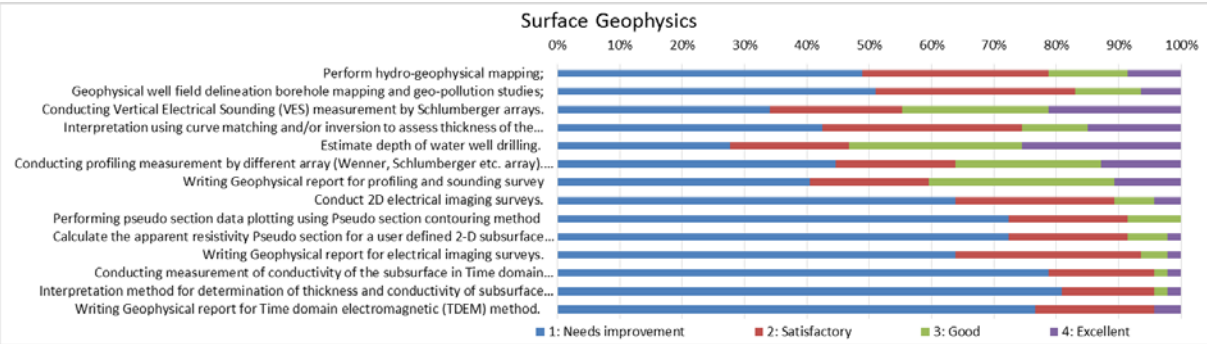
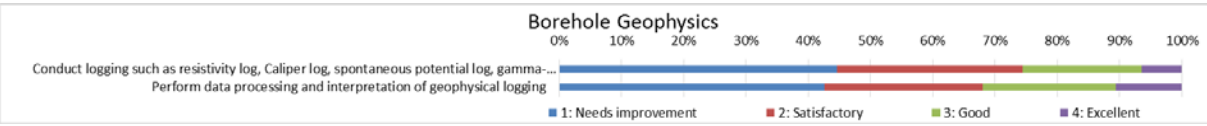


Figure 3: Summary of Questionnaire B for Groundwater Investigation









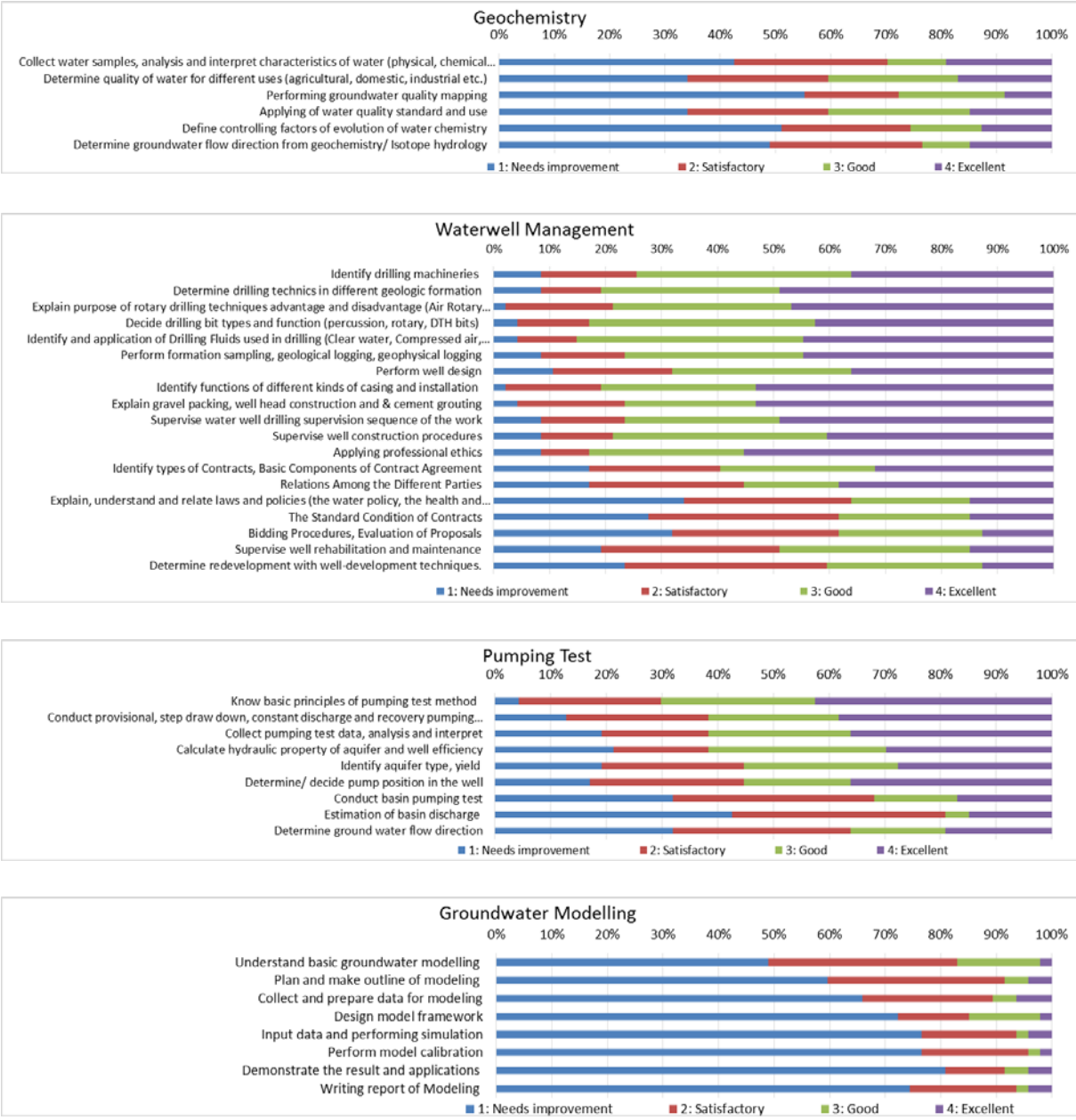


Figure 4: Self-evaluation results for the skill to complete the tasks related to Groundwater Investigation

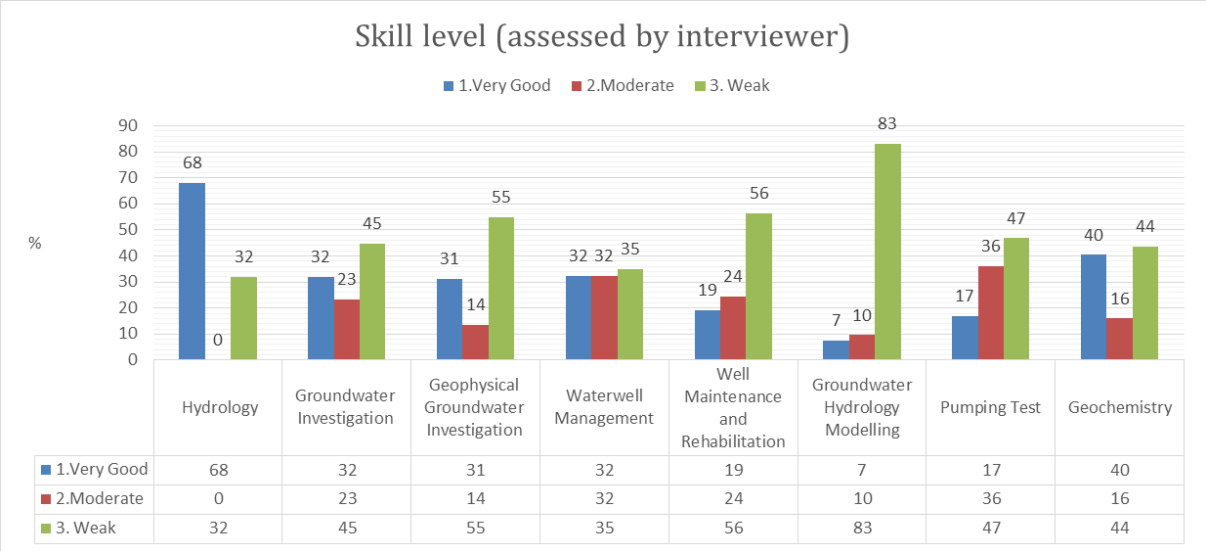
According to the results of Questionnaire B, most of the respondents show needs of improvement in groundwater modelling, surface and borehole geophysics, geochemistry and groundwater hydrology and some needs improvement in groundwater investigation method. Lack of practical skills in these fields negatively impacts their daily assignment.

On the other hand, they responded the technical gap is relatively low to moderate for drilling related activities which they are most frequently engaged. However, in actual case of drilling performance in the country there are a lot of problems, which may indicate low skill level in drilling management (supervision, drilling technology and contract administration). Regarding pumping test some of

respondents show needs of improvement. For well completion report preparation and pumping test analysis various organizations show low level of skill. Regarding water well rehabilitation, it is not frequently performed in the country because of low level of awareness and skills.

3.1.4 Level of practical skills of respondents (Direct interview with Checklist)

Direct interview and questioning were conducted based on the checklist prepared by interviewers. Summary of the results are shown in Figure 5 and Figure 6.



	Hydrology	Groundwater Investigation	Geophysical Groundwater Investigation	Waterwell Management	Well Maintenance and Rehabilitation	Groundwater Hydrology Modelling	Pumping Test	Geochemistry
1.Very Good	68	32	31	32	19	7	17	40
2.Moderate	0	23	14	32	24	10	36	16
3. Weak	32	45	55	35	56	83	47	44

Figure 5: Summary of checklist for Groundwater Investigation

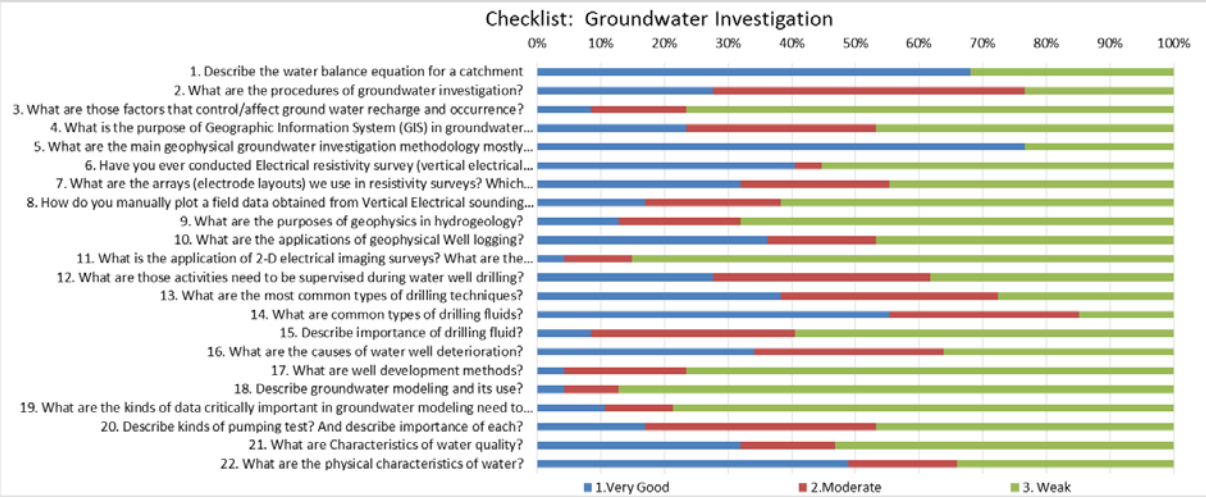


Figure 6: Results of direct interview for the skill level of respondents related to Groundwater Investigation

The result summarized in Figure 5 shows that majority of the respondents are weak in groundwater modelling, almost half of the respondents are weak in water well maintenance and rehabilitation. Lack

of skills and knowledge are observed in geophysical investigation, pumping test, groundwater investigation (preliminary desk work and detailed field work) and geochemistry.

Majority of respondents are weak in groundwater hydrology and water well management (contact administration, drilling technology and drilling supervision) which are also critically important.

Comparison by organizations does not show any significant variation in strength and weakness in particular subjects. Most organizations show similar technical gaps in most of the technical subject.

3.1.5 Group discussion and interview to managers/supervisors

(1) Results of group discussion

The major duties and responsibilities of most hydrogeologists in Regional Water Bureaus and Zone Water Offices are similar such as groundwater investigation, drilling supervision, occasionally project management for contract administration and construction, and preparation of progress report. Also, they provide technical support to all Woreda Water Offices in the region and coordinate and supervise the activities.

As for WWDE more emphasis is given to management of water well drilling thus the hydrogeologists are appointed as project managers. In case of WWDSE mostly they are involved in hydrogeological study and design of the projects and also drilling project supervision.

Following points are raised commonly to be given high emphasis during the group discussion.

- Software operation for hydrological analysis, ArcGIS, Aqua-Chem and geophysics
- Groundwater investigation in depth
- Reverse circulation system
- Drilling trouble shooting

Issues that affect performance of the respondents other than lack of skills are;

- Lack of proper equipment and software for geophysical instruments (2D imaging, electromagnetics, borehole loggers, and others)
- Lack of data (Topographic maps, satellite images, aerial photographs, geology and hydrogeological maps, reports etc.)
- Survey documents are not attached with contract documents which causes problems while doing supervision works
- Lack of understating on the work by authority
- The value for preliminary office work for data compilation and analysis is not properly understood by the managerial people

In addition to their technical gap, the following points were suggested for the improvement of EWTI training.

- Proper selection of trainees shall be done according to their experience (beginner, intermediate, experienced and specialization) while EWTI invite from the respective regions
- On demand course application between EWTI and contractor is not clearly specified so the training period is lost without effective training. It should be discussed in detail thoroughly before starting the training.
- The invitation letter arrived late and there is no preparation time to go to EWTI
- The questioner is good and covers almost all portions
- On demand course application is not established well/clearly
- There is no coordination within EWTI on proper delivering of teaching manuals, working tools and others.
- The existing EWTI research directorate should develop its service so the research results could be included in training as a case study and as a means of the solution for similar cases.

(2) Results of interview to manager/supervisor

All managers/supervisors responded that they agreed to the responses made by the hydrogeologists on the questionnaires about the frequency of work engagement with the listed tasks as well as to the responses made to their level of practical skills in performing each task.

The managers/supervisors suggested the following points to improve the skill level of their hydrogeologists:

- Capacitate their skill and knowledge through the training
- Provide the required training material
- Coaching, support and follow-up at site
- Attitudinal change and skill upgrade
- Advance training like software analysis

3.1.6 Technical gaps and priority subjects to be strengthened

The duties and responsibilities of hydrogeologists are more or less similar except WWDE is more focusing on drilling activities. As a result of analysis based on questionnaires, interview, checklist and group discussion, common tasks which have technical gap are as shown below.

- Water well management
  - ✓ Work sequence for well drilling supervision
  - ✓ Determine drilling technics in different geologic formation
  - ✓ Identification and application of fluids in drilling (Clear water, Compressed air, Foam, Water based mud and others)
  - ✓ Deciding drilling bit types and function (percussion, rotary, DTH bits)
  - ✓ Appling trouble shooting for drilling work
  - ✓ Applying professional ethics

- ✓ Preparation of contract for drilling works
- ✓ Laws and policies (the water policy, the health and sanitation policy, environmental policy, construction works policy, science and technology policy etc.)
- ✓ Performing proper well design depending on preliminary groundwater study and information collected during drilling
- ✓ Supervise well rehabilitation and maintenance
- ✓ Determine redevelopment with well-development techniques

- Pumping test
  - ✓ Proper pumping test data collection, analysis and interpretation.
  - ✓ Calculate hydraulic property of aquifer and well efficiency
  - ✓ Identify aquifer type and proper yield
- Geochemistry
  - ✓ Collection of water samples, analysis and interpretation of characteristics of water (physical, chemical and biological using software), presentation of the result indifferent diagrams pie chart and other, determine portability of the water for different purposes (domestic water supply, industry, agriculture and etc).
  - ✓ Performing groundwater quality mapping
  - ✓ Defining controlling factors of water chemistry
  - ✓ Determination of groundwater flow direction from geochemistry
  - ✓ Isotope hydrology analysis and interpretation
  - ✓ Applying of water quality standard and use
- Geological and geophysical borehole logging
  - ✓ Borehole geophysical data collection and interpretation using different parameters (caliper, gamma, spontaneous potential, resistivity, fluid resistivity temperature and others
  - ✓ Correlation of geophysical well logging result with geological logs for proper

In addition to the above mentioned common tasks with technical gap, the following tasks are specific to RWB, ZWO, WWCE and WWDSE, and significant technical gap was observed for those tasks.

- Hydrology
  - ✓ Hydro-metrology data acquisition, analysis and interpretation
  - ✓ Groundwater recharge estimation and water balance analysis
  - ✓ Analysis of hydrograph separation
  - ✓ Analysis of isotope hydrology
- Groundwater investigation
  - ✓ Preparation of geo-hydro-chemical mapping
  - ✓ Fracture trace analysis
  - ✓ Preparation of geological maps, correlation of stratigraphy, groundwater potential area identification and mapping (hydrogeological) with groundwater flow direction

- ✓ Identification of deep aquifers and corresponding hydrodynamics
- Geophysical investigation
  - ✓ Proper data collection by Vertical Electrical Sounding (VES) and analysis using curve matching and appropriate software
  - ✓ Borehole geophysical data collection and interpretation using different parameters (caliper, gamma, spontaneous potential, resistivity, fluid resistivity temperature and others
  - ✓ Resistivity profiling, making pseudo sections; identification of fractures
  - ✓ Application of 2D imaging (data collection analysis and interpretation)
  - ✓ Correlation of geophysical investigation with geology and hydrogeology to determined depth of water well drilling
  - ✓ Geophysical survey report writing
- Groundwater modeling
  - ✓ Understand basic groundwater modelling
  - ✓ Plan and make outline of modeling
  - ✓ Collect and prepare data for modeling
  - ✓ Design model framework
  - ✓ Input data and performing simulation
  - ✓ Perform model calibration
  - ✓ Demonstrate the result and applications

3.2 Drilling Technology (DT)

3.2.1 Target of survey

(1) Target organizations

In Ethiopia, the main contractors of drilling works are public organization, private company and NGO. The public organizations responsible for drilling works include Water Works Construction Enterprise (WWCE), Water Well Drilling Enterprise (WWDE) and Regional Water Bureau (RWB). In this survey, focus was given to public organizations due to time limitation. However, considering future target of EWTI training one private company was studied.

Table 3: Target organizations for Drilling Technology

Organizations	Region	No of organizations	No. of respondents
RWB	SNNP	1	4
WWCE	Tigray, SNNP	2	11
WWDE	Amhara, Oromia, Benishangul-Gumuz	3	13
Private company	Addis Ababa	1	2
Total	-	6	30

(2) Target respondents

The workers engaged in drilling works are structured as chief drillers, drillers and technicians according to their experience. In this survey for drilling technology group, in addition to chief drillers, drillers and technicians some supervisors were also included.

3.2.2 Frequency of activities respondents mostly engaged (Questionnaire A)

Major technical tasks regarding drilling technology are listed in Table 4. Engagement in these tasks was answered by the respondents using Questionnaire A.

Table 4: Technical tasks described in the questionnaire for Drilling Technology

Category	Contents
Introduction to Geology and Hydrogeology	Concept of geology and Ground water
	Concept of ground water investigation
	Understanding concept of Standard well design
	Performing Formation sampling
	Performing well logging
	Performing Pumping Test
Unit of measurement	Basic unit conversion
	Understanding basic mathematical formula related to drilling
Drilling Administrative Techniques	Applying safety precautions
	Performing Drilling plan and schedules
	Applying well organization team work in drilling
Drilling machine and Tools	Understanding Types of Drilling Machine and Equipment
	Differentiate and selecting Drilling Bits
	Differentiate and selecting Rotary and percussion Drilling Tools
	Install Casing and screen
Drilling Techniques	Drilling preparation on cable tool drilling technique
	Performing drilling operation on cable tool machine
	Drilling preparation on DTH(Air- Hammer) drilling technique
	Performing drilling operation on DTH(Air- Hammer) drilling machine
	Drilling preparation on Rotary drilling technique
	Performing drilling operation on Rotary drilling machine
	Understanding and preparing Drilling Fluid Technology
	Performing well construction
Function of Drilling Machines and Basic Welding and Cutting	Understanding function of drilling machine
	Understanding and operating Hydraulic system
	Able to know symbols of Hydraulic component
	Understanding Hydraulic pumps
	Performing welding and cutting
Data Collection Reporting	Well logging ,(Drilling and Litho logical)
	Preparing well completion Report
	Collecting well pumping test data.
Troubleshooting	Identifying common drilling problems
	Differentiate and applying fishing tools

Category	Contents
	Solving various cases /problems/ occurring on water well drilling

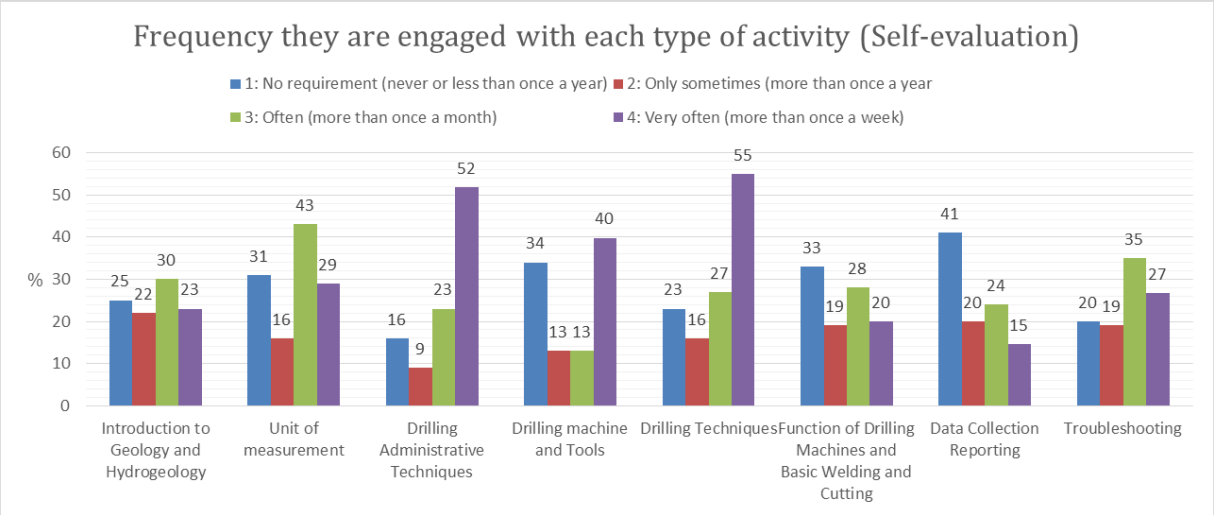
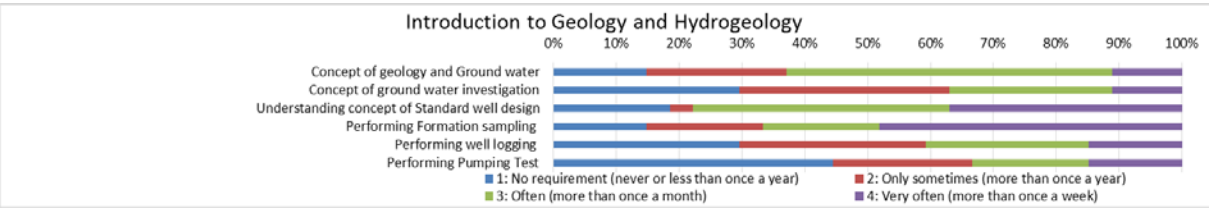
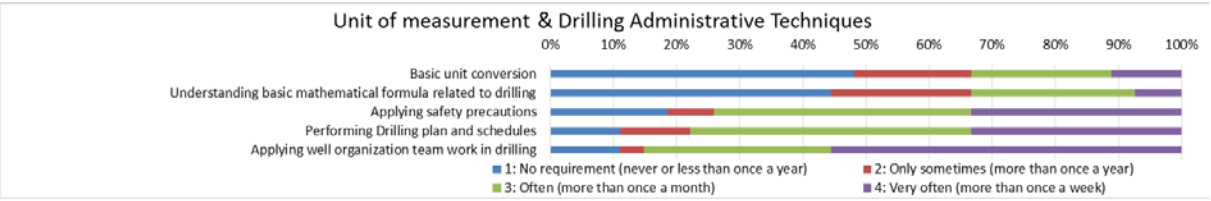
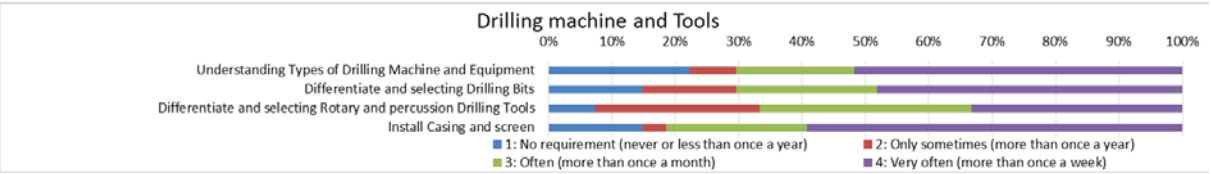
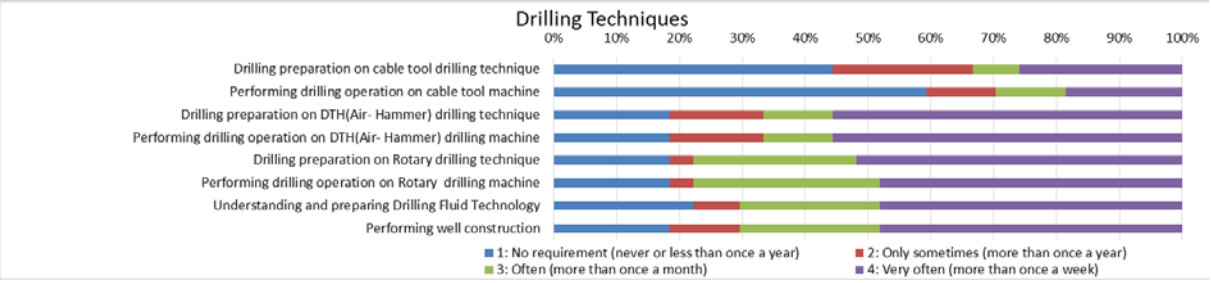


Figure 7: Summary of Questionnaire A for Drilling Technology









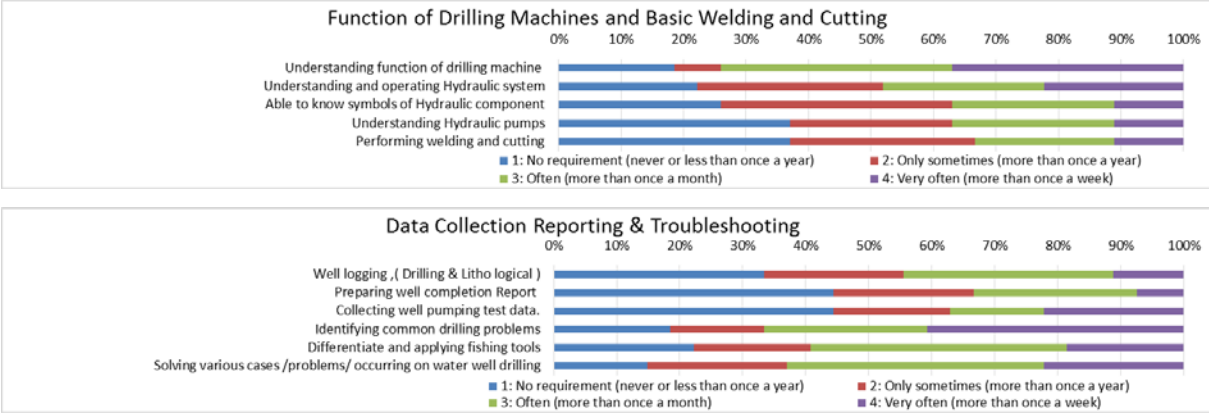


Figure 8: Frequency of activities which respondents are engaged with in their daily work related to Drilling Technology

The results of Questionnaire A show high engagement in drilling administrative techniques, drilling machine and tools and drilling techniques.

Among the detailed tasks of drilling technics, their engagement for preparation and operation of cable tools drilling technics is low and DTH and rotary drilling technics are the major ones which respondents are engaged.

Among the detailed tasks under drilling administrative technique, it is observed that the respondents pay high attention to the drilling team work and safety precautions. In addition, they are highly engaged in drilling planning and scheduling.

In the category of drilling machine and tools, the respondents show high engagement in installation of casing and screen, and selecting types of drilling machines and tools such as drilling bits.

Unit of measurement which includes calculation of viscosity, density, pressure, volume etc. is also showing relatively high involvement.

3.2.3 Level of practical skills of respondents (Questionnaire B)

To assess the level of practical skill, Questionnaire B was filled by respondents. The tasks described in Questionnaire B are the same as those in Table 4. The result of Questionnaire B is summarized in Figure 9 and results of each task are shown in Figure 10.

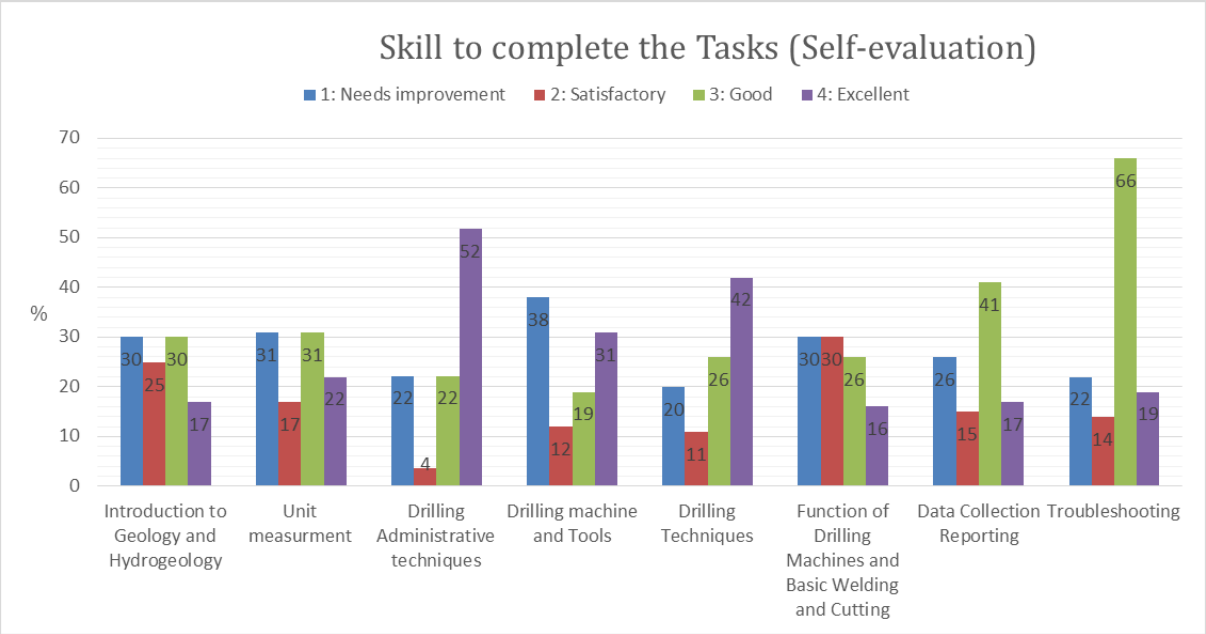
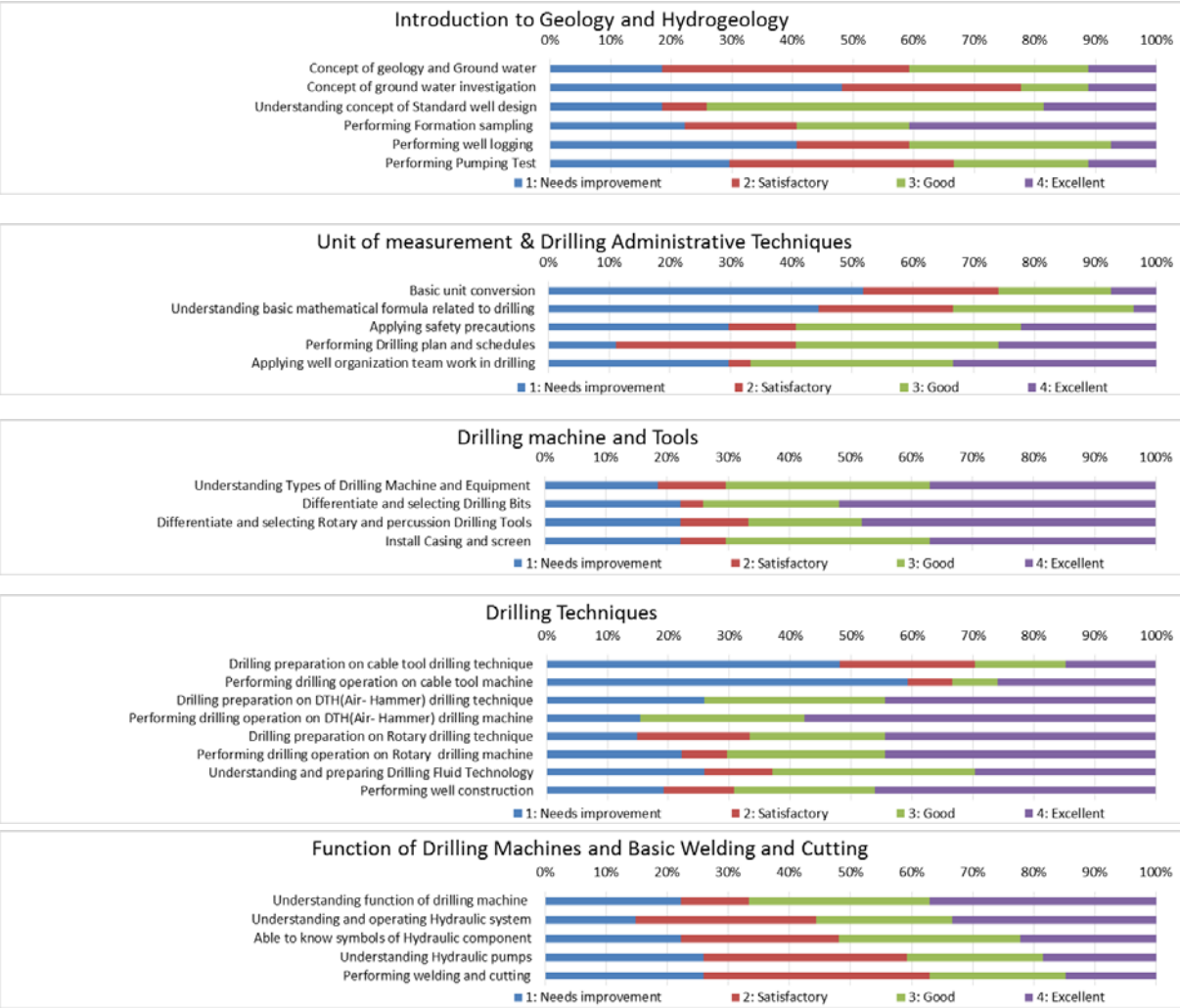


Figure 9: Summary of Questionnaire B for Drilling Technology



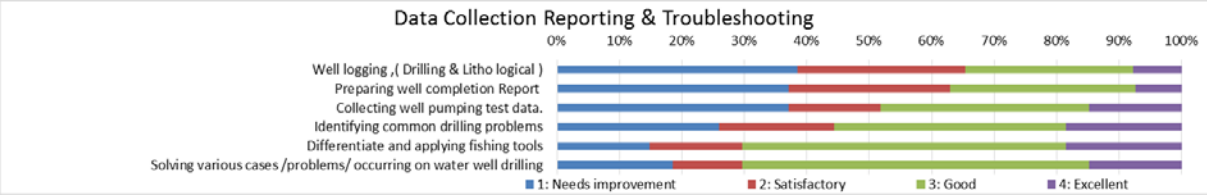


Figure 10: Self-evaluation results for the skill to complete the tasks related to Drilling Technology

As results of self-evaluation by the respondents, it shows high confidence (good or excellent) in the most categories except introduction to geology/hydrogeology and function of drilling machines and basic welding and cutting.

For the introduction to geology and hydrogeology, especially they answered low knowledge in groundwater investigation.

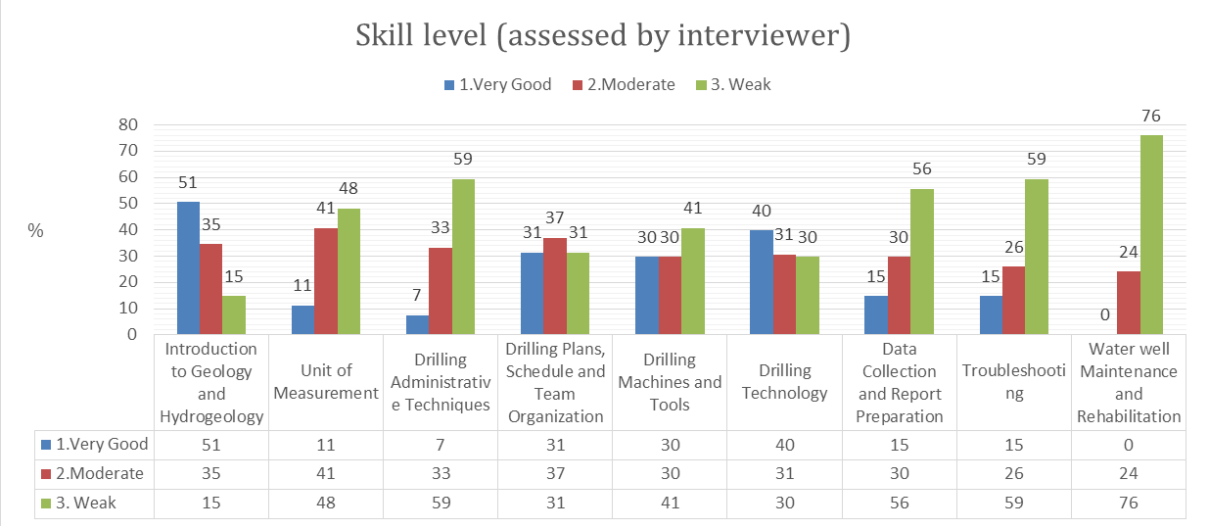
Among the tasks in drilling technics, they show high needs of improvement for cable tools drilling technics and identifying its accessories. This is because they have little experience in using cable tools machine and they are more relying on DTH drilling method in the actual field work.

In the function of drilling machines and basic welding and cutting, they show high needs of improvement especially in welding and cutting, which have been considered as a work of mechanics.

As for the unit of measurement and drilling administrative techniques, they express low skills on basic unit conversion and mathematical formula for drilling.

3.2.4 Level of practical skills of respondents (Direct interview with Checklist)

Direct interview and questioning were conducted based on the checklist prepared and filled by interviewers. The results are shown in Figure 11 and Figure 12.



	Introduction to Geology and Hydrogeology	Unit of Measurement	Drilling Administrative Techniques	Drilling Plans, Schedule and Team Organization	Drilling Machines and Tools	Drilling Technology	Data Collection and Report Preparation	Troubleshooting	Water well Maintenance and Rehabilitation
1.Very Good	51	11	7	31	30	40	15	15	0
2.Moderate	35	41	33	37	30	31	30	26	24
3. Weak	15	48	59	31	41	30	56	59	76

Figure 11: Summary of Checklist for Drilling Technology

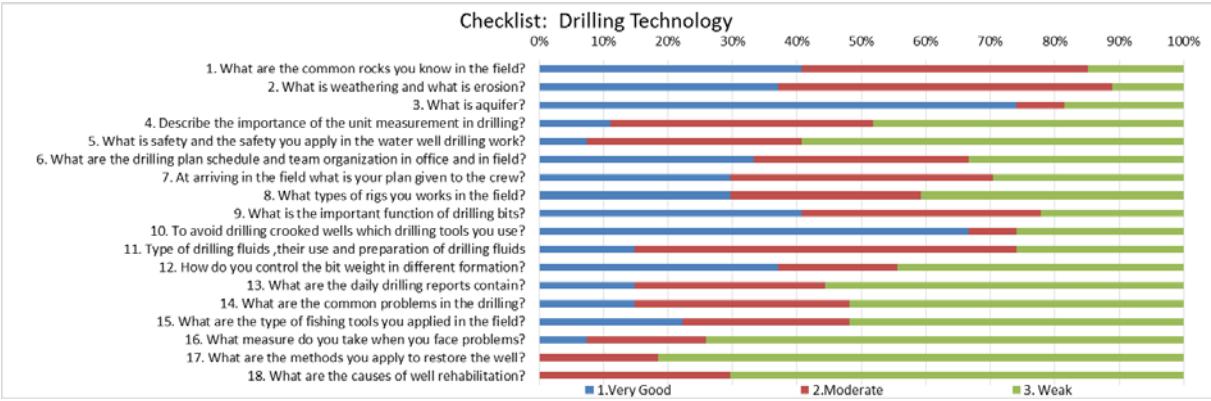


Figure 12: Results of direct observation for the skill level of respondents related to Drilling Technology

The respondents show relatively high engagement and high needs of improvement in drilling administration. This is considered true and supported by the results of direct interview as the administrative tasks are generally carried out by geologists or supervisors, however, it is very important for drillers to have skills and knowledge especially on planning, safety precaution and team work.

In terms of concept of geology and hydrogeology, although it shows less involvement in their work and low skill and knowledge, it is considered important after the direct interview because it is relevant to the drilling and it will improve their capacity of daily output.

According to their self-assessment, unit of measurement also shows low skill, which is also considered true through the direct interview. Their basic mathematical knowledge related to drilling is very poor. It is a critical issue to be considered thoroughly to prevent drilling problems encountered in the field.

Understanding of drilling machines also shows weakness in their skills. This is because the maintenance has been the responsibility of mechanics. Moreover, the technical specification and operation manuals are not delivered to the chief drillers to study thoroughly the machines which they use. However, in the actual field work, there are always some mechanical troubles and it is drillers who have to solve the problems because sometimes it requires urgent solution. The same case is applied to the skills for welding and cutting.

Result of work engagement for data collection is shown low in their self-evaluation. However, lack of drilling information and unreliable data are one of the critical problems in Ethiopia. Generally, data collection is a responsibility of geologists or supervisors but drillers also should understand the importance of collecting the data such as geological samples, penetration rate, aquifer strike depth, encountered drilling problems etc. and reporting.

Although the tasks of well rehabilitation and maintenance were not included in Questionnaire A and B, the awareness and their skills of respondents were investigated through the direct interview because well maintenance technology is considered as one of the most important issues in the country. It shows high weakness in their skills and awareness due to lack of practical experience and equipment.

As for cable tools drilling technic, even though the machine and technic are considered outdated and it shows less engagement in their work, there is a still need of this technic in some particular geological conditions. Only senior drillers have knowledge and skills to operate this machine, which have not been transferred to younger drillers.

3.2.5 Group discussion and interview to managers/supervisors

Needs of deep well drilling application was raised in some of the group discussions. Currently, deep well drilling is frequently engaged in regions and Addis Ababa due to scarcity of shallow aquifers and to tap more water at depth. They encounter drilling problems frequently so they expressed their needs to update their technic for deep well drilling. The technic includes differential sticking, high pressure stressing, tools stacking and more importantly proper drilling fluid application.

Although there are some differences in geological formations among regions, no big difference was observed in the technical problems and technical gap among the regions. However, there is a big difference in organizational structures among the regions. For example, Benishangul-Gumuz has weaker organizational capacity compared to other regions, which affect the drilling activities.

The followings are the most common technical gap commented by managers and supervisors of respondents.

- Drilling machine, tools and their application (drilling machinery maintenance problem) and function of drilling machine
- Concept of geology and pumping test (geology and hydrogeology, well logging, pump testing)
- Drilling problems and trouble shouting
- Drilling fluid technology (mud property measurement tools such as viscometer, marsh funnel etc.)
- Well rehabilitation techniques (water well maintenance and rehabilitation and techniques)
- Planning and scheduling, drilling task (well completion report)
- Water well drilling design problem
- Problem on preparation of specification in spare part procurement
- Unit of measurement and basic mathematical formula
- Drilling administrative techniques (safety and planning)
- Data collection and report preparation
- Performing basic welding and cutting
- Professional ethics

In addition, the participants raised the issue of separation of training programs according to their level of experience. Senior drillers who have relatively better practical skills are lacking in conceptual (theoretical) understanding, on the other hand, junior drillers are particularly lacking in practical skills.

3.2.6 Technical gaps and priority subjects to be strengthened

The survey outcome shows similar gaps and problems whether it is public or private. The followings are considered as the tasks which have most critical technical gap among the target respondents.

Drilling practice

- Management of deep well drilling on differential sticking, high pressure stressing, tools stacking and proper drilling fluid application
- Drilling fluid preparation, application and utilization using bentonite, polymer etc.
- Operation of percussion rig (cable tools)
- Well rehabilitation and maintenance
- Pumping test and data collection

Mechanics and maintenance

- Identifying proper solution for parts of drilling machines such as hydraulic system, hammer cylinder, mud pump etc.
- Basic welding and cutting to maintain drilling machines and tools

Geology

- Identifying rock type and characteristics of geological formation

Management

- Data compilation and reporting (proper collection and description of cutting samples)
- Drilling management (crew management, planning and scheduling, safety precaution etc.)
- Mathematical application to drilling (measurement of viscosity, density, torque etc.)

3.3 Drilling Machinery Maintenance Technology (DMMT)

3.3.1 Target of survey

(1) Target organizations

Organizations that mainly perform water well drilling operations are listed as following

- Water Works Construction Enterprise (WWCE)
- Regional Water Works Construction Enterprise (WWCE)
- Regional Water Well Drilling Enterprises (WWDE)
- Regional Water Bureau (RWB)
- Private Company

The target organizations covered under this survey of drilling machinery maintenance technology are

shown in the table below.

Table 5: Target organizations for Drilling Machinery Maintenance Technology

Organizations	Region	No. of organizations	No. of respondents
RWB	SNNP	1	3
WWCE	Tigray	1	8
WWDE	Amhara, Oromia and SNNP	3	12
Private Company	Addis Ababa	1	1
Total		6	24

(2) Target respondents

The main target respondents of this survey are mechanical engineer and mechanic who are the key staff involved in maintenance of drilling rig, air compressor and related equipment. In addition, one electrician and one chief driller were interviewed in Tigray region because they are working in a maintenance team.

3.3.2 Frequency of activities respondents mostly engaged (Questionnaire A)

The list of activities assessed under DMMT in questioner A and B are described in the table below.

Table 6: Technical tasks described in the questionnaire for Drilling Machinery Maintenance Technology

Category	Contents
Diesel Engine Operation and Maintenance	Maintaining engine crank mechanism
	Maintaining valve mechanism
	Maintaining air intake and exhaust
	Maintaining cooling system
	Maintaining lubricating system
	Maintaining fuel system
	Maintaining staring aid of engine
	Maintaining over all engine components
	Maintaining common rail EFI diesel engine
	Maintaining and checking ECM engine sensors and by using diagnoses scan tools
Percussion (cable) Tools Rig Operation and Maintenance	Identifying cable tools (percussion) rigs components
	Carry out operation principles of cable tools rig
	Performing spudding mechanism, Bull reel, calf reel, Sand reel and Derrick hoist forward and reverse direction Power train mechanism and operation principle.
	Plan preventive and schedule maintenance and its spare
	Trouble shooting and Maintaining percussion rigs.
THD Rotary Drilling Rig Operation and Maintenance	Preparing technical specification of rotary drilling rigs
	Perform operation principle of drilling rigs main components (Mast and mast rising cylinder, Drill head, Pull down cylinder, Mud pump, Foam pump, Draw works, Sand reel, Leveling jacks, power tong, hammer oil pump, Rig carrier truck

Category	Contents
	Perform operation principle of hydraulic system, hydraulic oil, tank, pump, motor, cylinder, control valves, hydraulic filters, lines, hoses, seals, gauges
	Planning preventive and schedule maintenance and its spare
	Maintaining THD Rotary gear box and water swivel
	Maintaining Pull down cylinder, chains and sheaves
	Maintaining Hydraulic components (hydraulic oil, tank, pump, motor, cylinder, control valves, hydraulic filters, lines, hoses, seals, gauges)
	Maintaining Mast cylinder, leveling jacks and power tong
	Maintaining Mechanical and Hydraulic winch
	Maintaining Mud pumps and systems
	Maintaining Foam injection pump systems
	Perform Reading practice on THD rotary drilling rig hydraulic circuits and electrical circuit
	Perform Trouble shooting and maintenance of rigs
Air Compressor Operation and Maintenance	Identifying types of air compressor and its operation system
	Perform operation principle of air compressors main component
	Maintaining compressor driving, air, oil and regulating System components
	Perform reading practice of pneumatic circuit
	Identifying Electrical system of air compressor
	Perform operation principle of electrical parts of Compressor
	Perform Reading practice on air compressor electrical circuits
	Planning preventive and schedule maintenance and its spare
	Perform Trouble shooting and maintenance of air Compressor
DTH Air Hammer Operation and Maintenance	Identifying types of air hammer and its operation system
	Perform operation principle of air hammer main component
	Perform Trouble shooting and maintenance of DTH air hammer

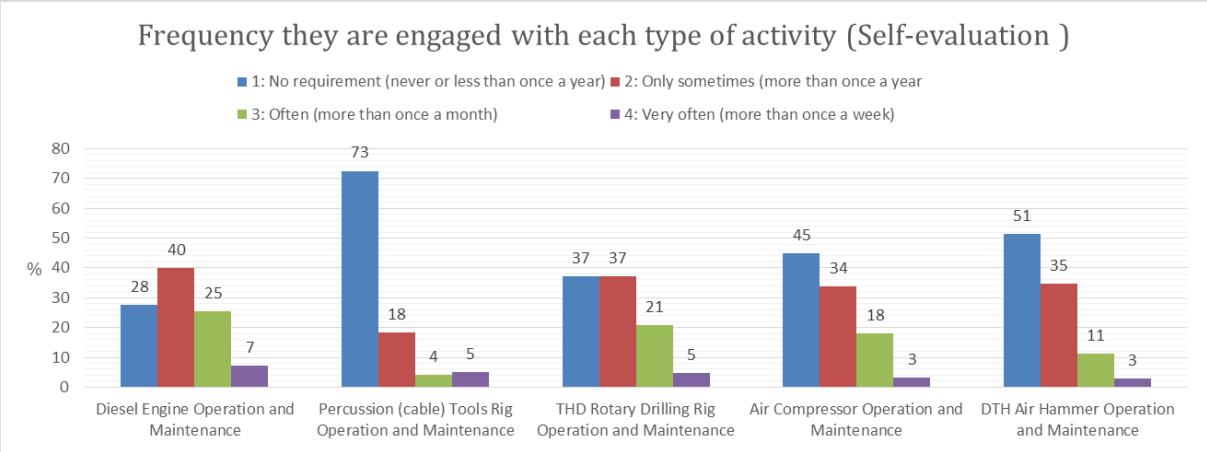
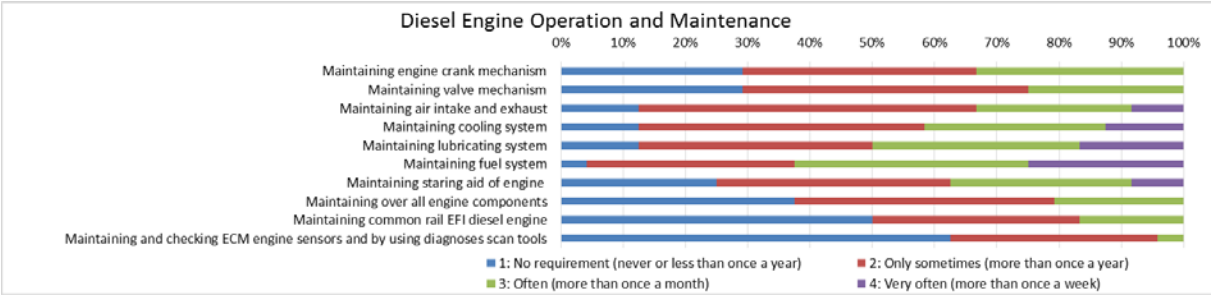
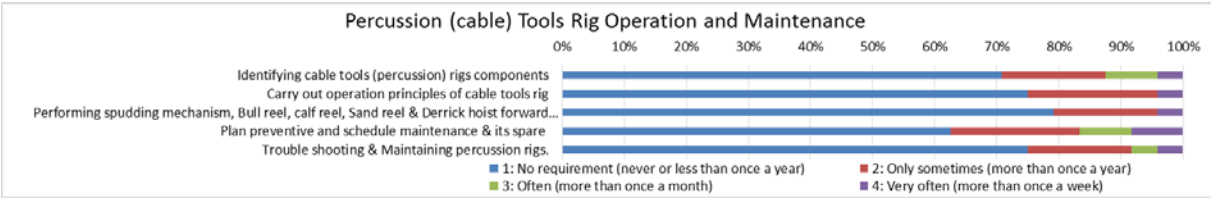
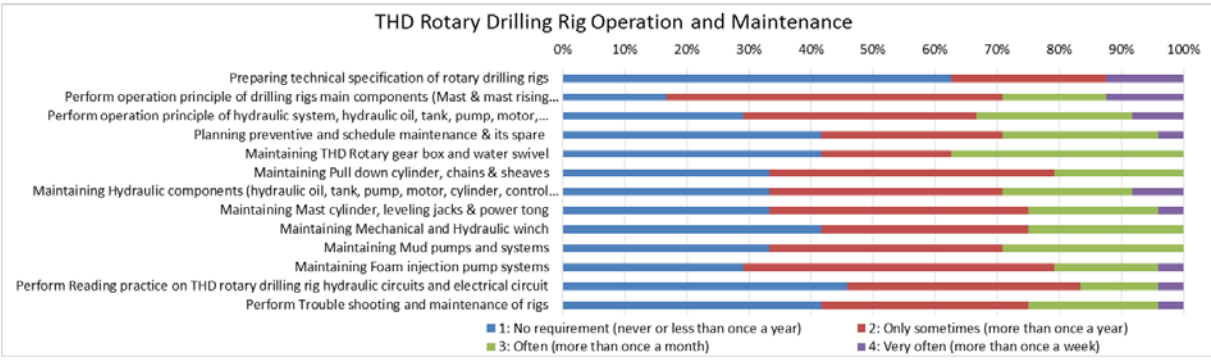
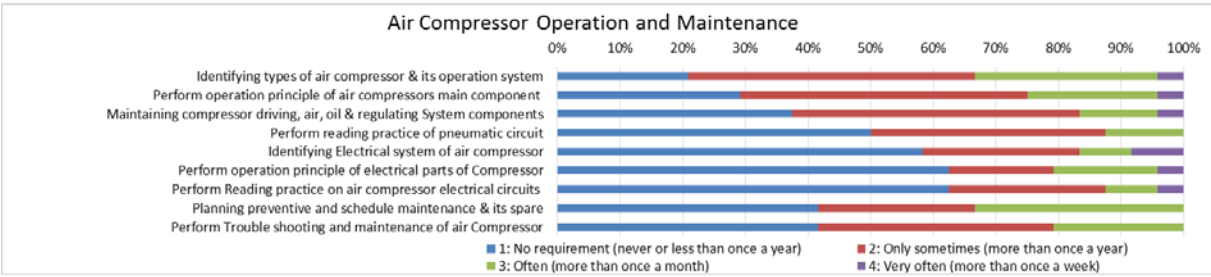


Figure 13: Summary of Questionnaire A for Drilling Machinery Maintenance Technology









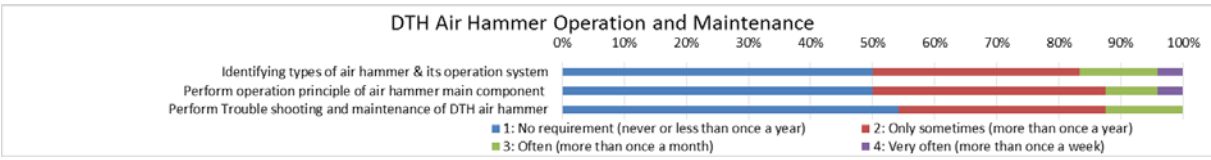


Figure 14: Frequency of activities which respondents are engaged with in their daily work related to Drilling Machinery Maintenance Technology

Comparing the responses given by the different target institutions, the result shows that there are no significant differences.

According to the respondents, the engagement in;

- Percussion (cable tools) rig operation and maintenance is very low. The reason is because its drilling output per day is in general very low compare to THD rotary machines and due to this

fact Government organizations and private drilling companies tend not purchasing this type of rig and currently functional percussion machines are very few in number and they are used mainly for fishing and pump testing which are also very old.

- DTH air hammer is low. This is because it is usually maintained by drillers not by mechanics according to respondents.
- Diesel engine, the respondents mostly engaged tasks are maintenance of air, fuel, cooling and lubricating system which is mainly focused on servicing and minor maintenance.
- Air compressor, the respondents mostly engaged tasks are compressor driving, air, oil and regulating system and maintenance of electrical and electronics part is relatively low since most of them are mechanics and unavailability of skilled persons on the specific system.
- THD rotary drilling rig result shows low. The reason is the components of rig parts are many such as diesel engine, ECM of diesel engine, PTO, pump drive gear box, hydraulic pumps, motors, control valves, mud and water foam injection pumps, hydraulic winches, rotary gear box, pull down cylinder, mast and leveling jacks, power tongue, hammer oil pump, electrical system of the rig, pneumatic system, etc. Maintaining those components needs highly qualified technicians on different discipline. However, in all workshops there is lack of skilled technicians. Additionally, most of organizations have no maintenance manual of their rigs, lack of spare parts, very poor workshop facility (no troubleshooting, maintenance and testing equipment and tools).

3.3.3 Level of practical skills of respondents (Questionnaire B)

The respondent's level of practical skill as per questioners B on the tasks listed in Table 6 is shown in Figure 15 and Figure 16.

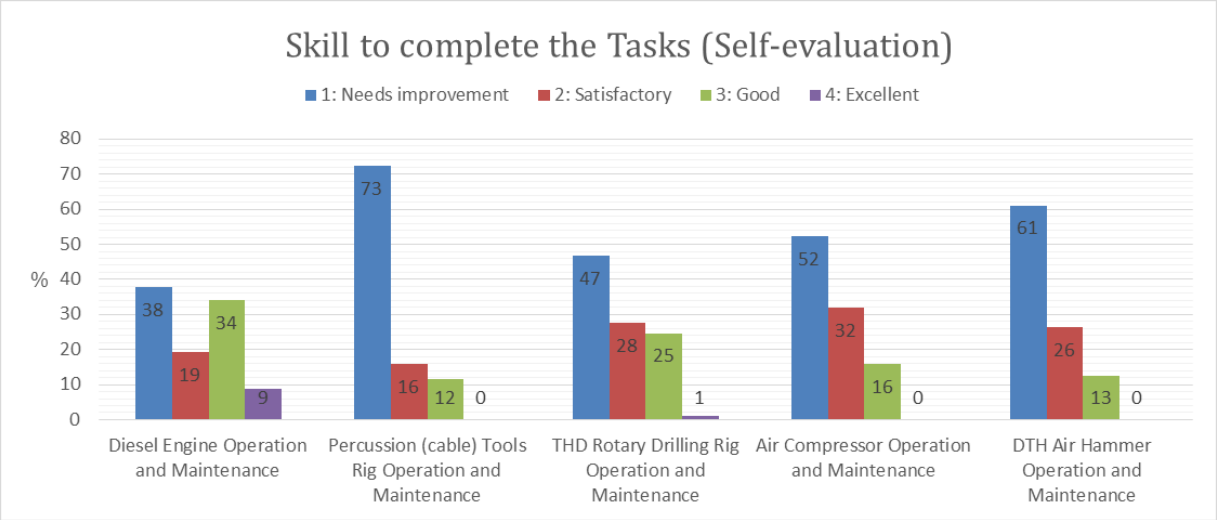


Figure 15: Summary of Questionnaire B for Drilling Machinery Maintenance Technology

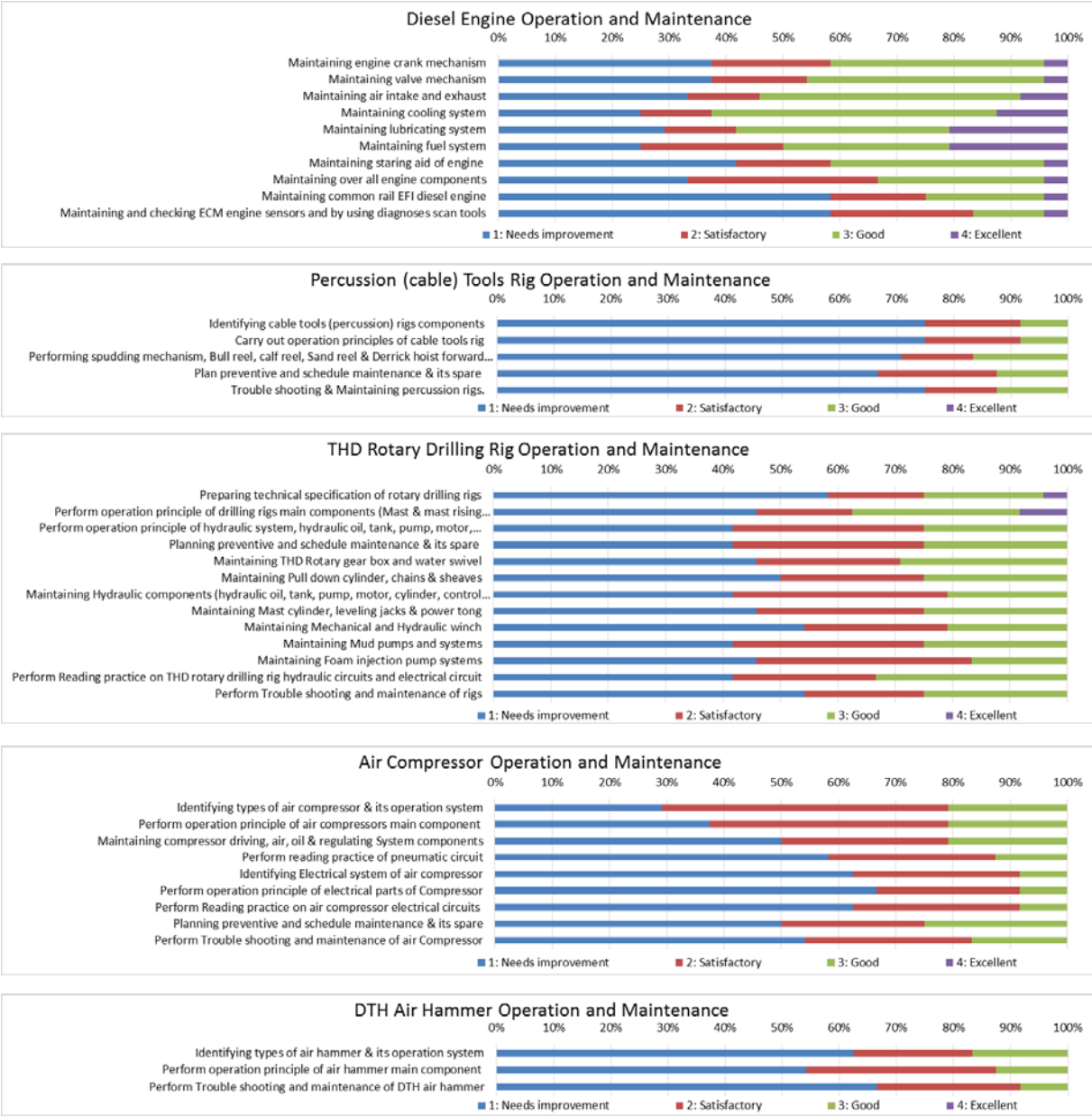


Figure 16: Self-evaluation results for the skill to complete the tasks related to Drilling Machinery Maintenance Technology

Comparing the response given by the different target institutions, the result shows that there are no significant differences.

According to the result of questionnaire, the skill level in

- Percussion (cable tools) rig operation and maintenance is very low. The reason is because of currently functional percussion machines are very few in number and they are also very old machines.
- DTH air hammer is low. This is because it is usually maintained by drillers not by mechanics according to respondents.
- Diesel engine, the respondents have a skill gap mostly on maintenance of ECM engine.

- Air compressor, the respondents have a skill gap on maintenance of electrical and electronics part of air compressor.
- THD rotary drilling rig result shows low. The reason is most of the mechanics have only basic theoretical knowledge on maintenance of their rig and unavailability of maintenance manual of their rigs.

3.3.4 Level of practical skills of respondents (Direct interview with Checklist)

Direct interview and questioning were conducted based on the checklist prepared and filled by interviewers. The respondent's level of practical skill as per result of direct interview (checklist) is summarized in Figure 17 and Figure 18.

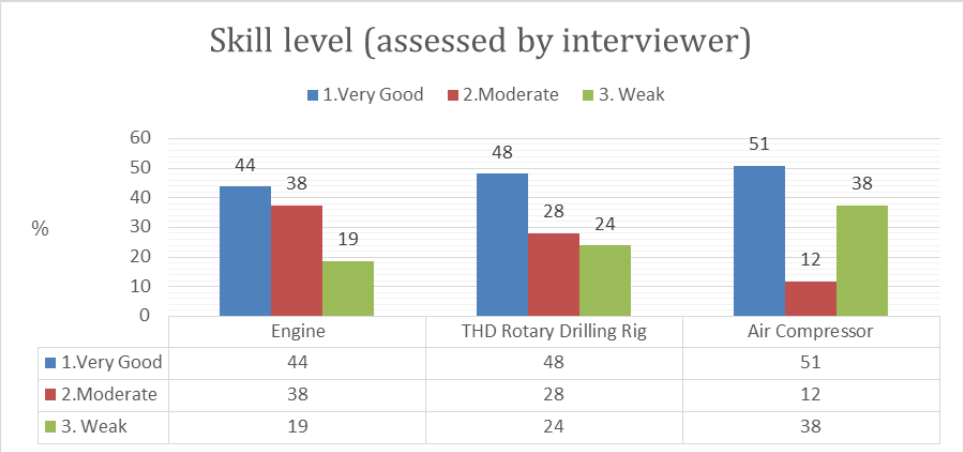


Figure 17: Summary of Checklist for Drilling Machinery Maintenance Technology

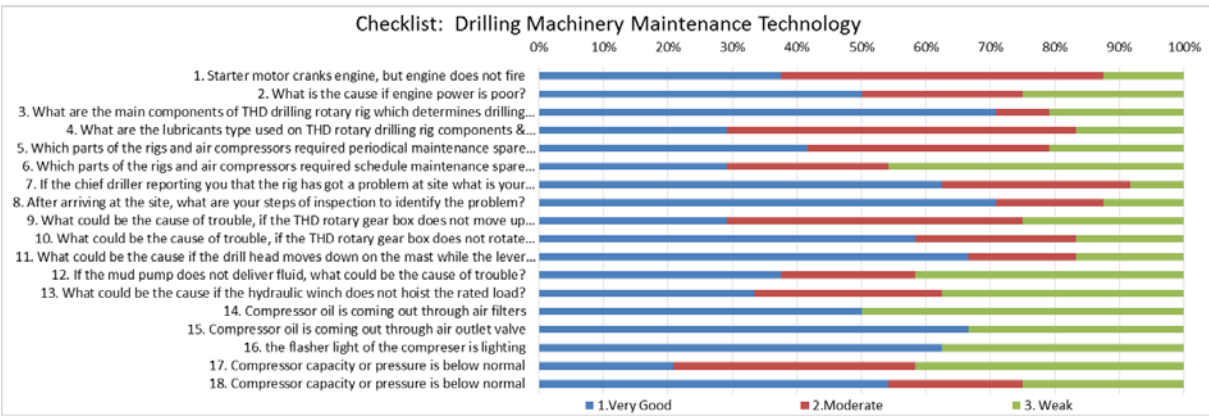


Figure 18: Results of direct observation for the skill level of respondents related to Drilling Machinery Maintenance Technology

The following is the results of direct interview. There was no significant variation of responses found among the respondent organizations.

- The maintenance of diesel engine is very important because all the machines are driven by

diesel engine. They have relatively better knowledge for conventional diesel engine but there is a skill gap on maintenance of ECM-EFI diesel engine. Maintenance of fuel injection pump is also weak and they lack experience mainly because they don't have calibrating and measuring machines and tools. In addition, experience of auto-electricity is limited because they think this is a job of electricians.

- For THD rotary drilling rig, they showed relatively good understanding as shown in the graph. However, when it comes to the practical skill, it is observed that they have a big skill gap especially on maintenance of hydraulic system components, and maintenance of mud pump, foam injection pump, top head gear rotary box, pull-down cylinder, etc. In addition to the above, understanding of hydraulic, electrical and pneumatic circuits of their rigs are little.
- For air compressor, they have a skill gap identifying the problem and programming of electronic part, and electrical system.

In general the majority of respondents have a skill gap on trouble shooting and maintenance of drilling rigs and air compressors.

3.3.5 Group discussion and interview to managers/supervisors

(1) Results of group discussion

The technicians' daily activities are summarized as below.

- Drilling machineries and equipment maintenance
- Light vehicle, heavy duty trucks, cranes, rig and air compressor maintenance
- Preventive (scheduled) maintenance and corrective maintenance
- Inspection at working site of drilling rigs

Suggested points which have to be given high emphasis are;

- Mechanics should also be trained drilling technology to understand about operation of the rig which will be easy to them to identify rigs problem, test and maintain it.
- ECM engine, drilling rig and air compressor
- Compressor electrical and electronics part
- Drilling rigs hydraulic and electrical system and main components

Issues that can affect performance other than lack of skills are;

- Lack of proper equipment, tools and materials
  - ✓ Very poor workshop facilities
  - ✓ No maintenance equipment and tool
  - ✓ No testing equipment, tools, and diagnosis scan tools
  - ✓ Lack of spare parts
  - ✓ Lack of drilling rigs and air compressor maintenance manuals

- Lack of time
  - ✓ Time limitation due to lack of personnel
- Lack of understating on the work by authority
  - ✓ The value given for technicians by the managerial people is very less
  - ✓ Freedom for mechanics

(2) Results of supervisor/managerial interview

The managers/supervisors accepted all the results observed through questionnaire, checklist and group discussion with their technicians/engineers. Comments and suggestions given by their supervisors to improve the competency level of technicians/engineers are;

- Providing training and upgrading their skill on;
  - ✓ Troubleshooting and maintenance for drilling rigs hydraulic system, main components and air compressor.
  - ✓ Troubleshooting and maintenance for ECM of diesel engine, electrical system of drilling rig and air compressor.
- Supplying required maintenance testing and tools

3.3.6 Technical gaps and priority subjects to be strengthened

The result of analysis of tasks with high skill gap based on direct interview (checklist) and group discussion with the support of the result obtained from the remaining survey tools are summarized below;

- THD rotary drilling rig operation and maintenance
  - ✓ Understanding of THD rotary drilling rig technical specification
  - ✓ Maintenance of top head gear box
  - ✓ Maintenance of hydraulics systems
  - ✓ Maintenance of pull up & pull down cylinder,
  - ✓ Maintenance of mud pump and foam injection pump
  - ✓ Maintenance of mechanical & hydraulic winch
  - ✓ perform trouble shooting & maintenance of rig
  - ✓ Assembling and disassembling of drilling rigs main components (Pump drive gear box, Hydraulic pumps, motors, control valves, lines, filters, seals & gauges, mud pump, foam pump, winches, stabilizer, mast, hammer oil pump, etc)

- Air compressor
  - ✓ Assembling and disassembling of air compressor driving system, air, oil & regulating system components
  - ✓ Maintenance of air compressor driving system, air, oil & regulating system components

- ✓ Reading of hydraulic & pneumatic circuits

- Diesel engine
  - ✓ Overhaul and maintenance of common rail EFI and ECM diesel engine
  - ✓ Maintenance of fuel system
  - ✓ Maintenance of lubricating & cooling system

3.4 Electro-Mechanical Maintenance Technology (EMMT)

3.4.1 Target of survey

In the water sector, electro-mechanical maintenance activities are mainly carried out in Regional Water Bureau, Zonal Water Offices, Woreda Water Offices and Town Water Service offices. In addition to these organizations, there is growing demand on EMMT in the irrigation projects which use electro-mechanical equipment. The target organizations of this survey are shown in Table 7.

Table 7: Selected target organizations for Electro-Mechanical Equipment and Machinery Maintenance Technology

Organizations	Region	No of organizations	No. of respondents
Regional Water Bureau	Benishangul-Gumuz, SNNP and Tigray	3	9
Zone Water Office	SNNP and Amhara	6	11
Woreda Water Office	Benishangul-Gumuz, Tigray, SNNP, Amhara and Oromia	11	19
Town Water Service Office	SNNP, Benishangul-Gumuz, Amhara, Oromia and Tigray	7	19
Irrigation Project	Amhara	1	4
Total		28	62

(2) Target respondents

The target respondents who are engaged with electro-mechanical tasks in the above-mentioned water sector offices are mechanical engineer, electrical engineer, electro-mechanical engineer, technician (mechanic, electrician, and electro-mechanical).

3.4.2 Frequency of activities respondents mostly engaged (Questionnaire A)

The list of activities assessed under EMMT in the questionnaire are described in Table 8 and the results are summarized in Figure 19 and Figure 20.

Table 8: Technical tasks described in the questionnaire for Electro-Mechanical Maintenance

Technology

Category	Contents
Using Electrical Measuring Instruments	Multi meter/clamp meter
	Megger
	Tachometer
Electrical Motor and Generators Maintenance	Disassembling and assembling electric motors
	Rewinding motors
	Operating generators
	Maintaining generators
	AVR testing
	Maintaining starter motor of generators
	Maintaining battery
	Preparation of electrolyte solution
	Measuring the electrolyte solution
	Maintaining alternator
	Identifying operational parts of an electrical generator
Water Pump Operation and Maintenance	Operation of water pumps
	Maintaining surface pumps
	Maintaining submersible pumps
	Maintaining hand pumps
	Maintaining rope pumps
	Maintaining pedal pumps
Operation and Maintaining Diesel Generators	Operating diesel generators
	Maintaining engine crank mechanism
	Maintaining valve mechanism
	Maintaining air intake and exhaust
	Maintaining cooling system
	Lubricating system
	Maintaining fuel system
	Maintaining electrical system
Installation	Genset
	Surface pumps
	Submersible pumps
	Manual pumps (hand pump, rope pump, pedal pumps)
Switch Board Operation and Maintenance	Testing contactors and relays
	Selecting circuit breaker
	Fault finding using continuity tester
	Fault finding using voltmeter
	Reading and tracing Electrical schematic diagram
Programmable Logic Controllers	Performing troubleshooting of PLC supported switch boards

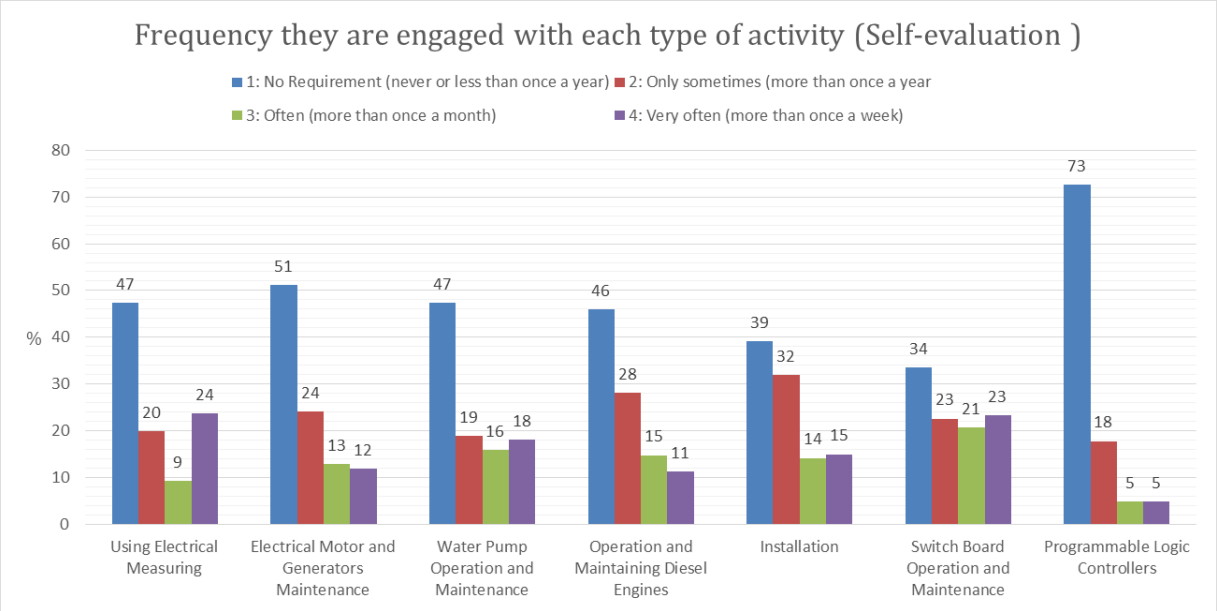
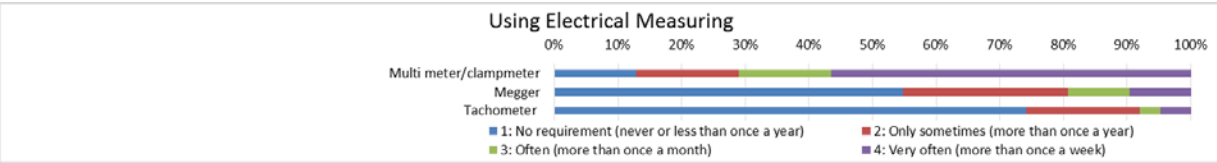
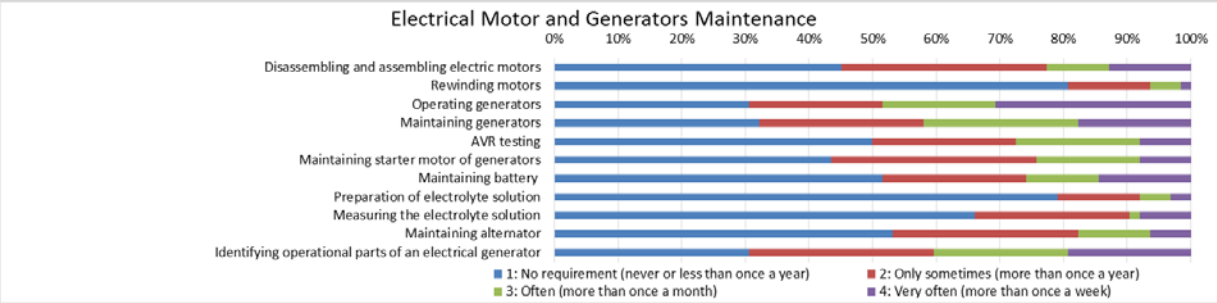
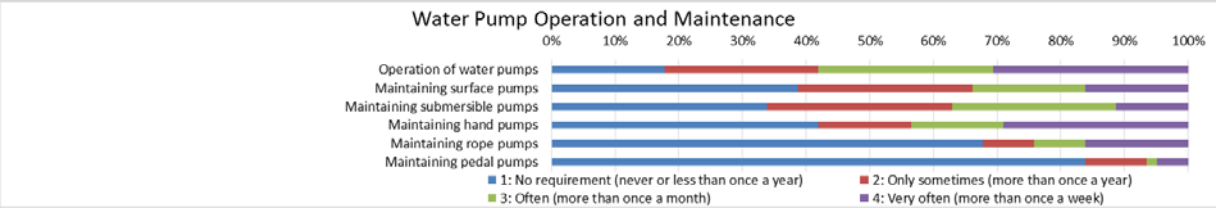


Figure 19: Summary of Questionnaire A for Electro-Mechanical Maintenance Technology







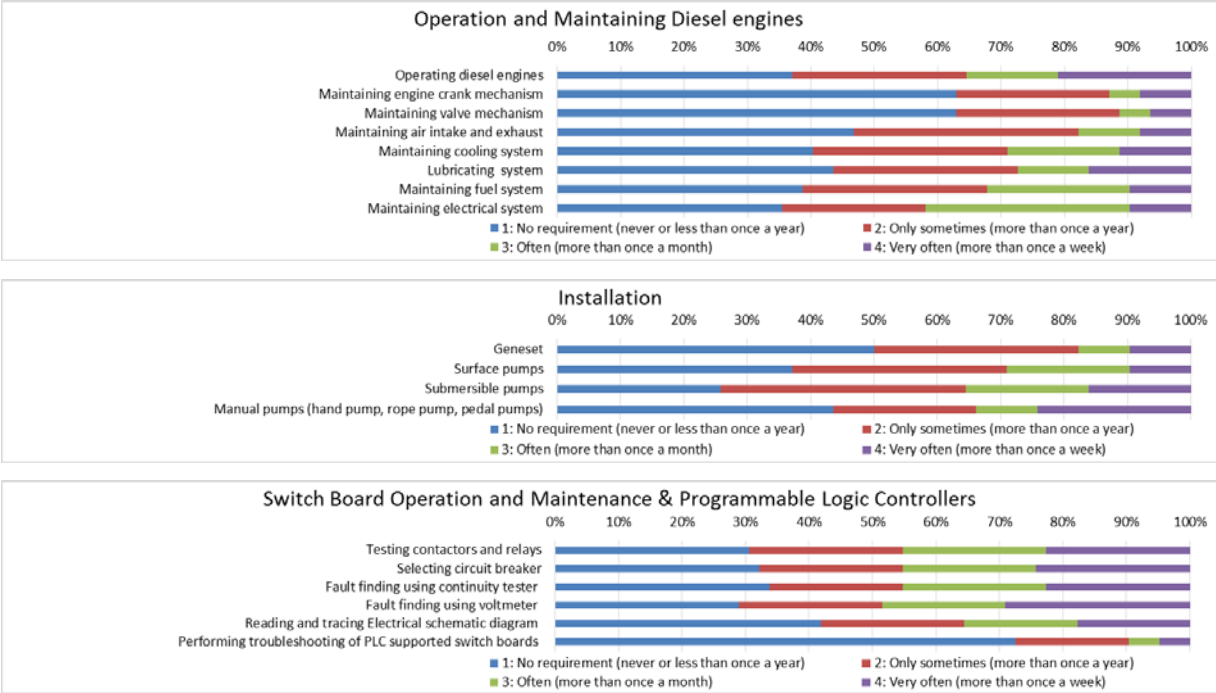


Figure 20: Frequency of activities which respondents are engaged with in their daily work related to Electro-Mechanical Maintenance Technology

Comparing the responses given by the different target institutions, no significant difference was observed.

According to the questionnaire A, the respondents are mostly engaged in:

- Using electrical measuring (particularly multi-meter,)
- Switch board operation and maintenance (mostly fault finding using volt-meter, testing contactor and relays, fault finding using continuity tester)
- Water pump operation and maintenance (operation of water pump, maintaining hand pump and surface pump)

On the other hand, respondents least engagements are in performing programmable logic control and electrical motor and generators maintenance (especially in performing rewinding motors, preparation and measuring of electrolyte solutions etc.).

3.4.3 Level of practical skills of respondents (Questionnaire B)

The respondents' level of practical skill as per questionnaire B on the above listed activities is shown in Figure 21 and Figure 22.

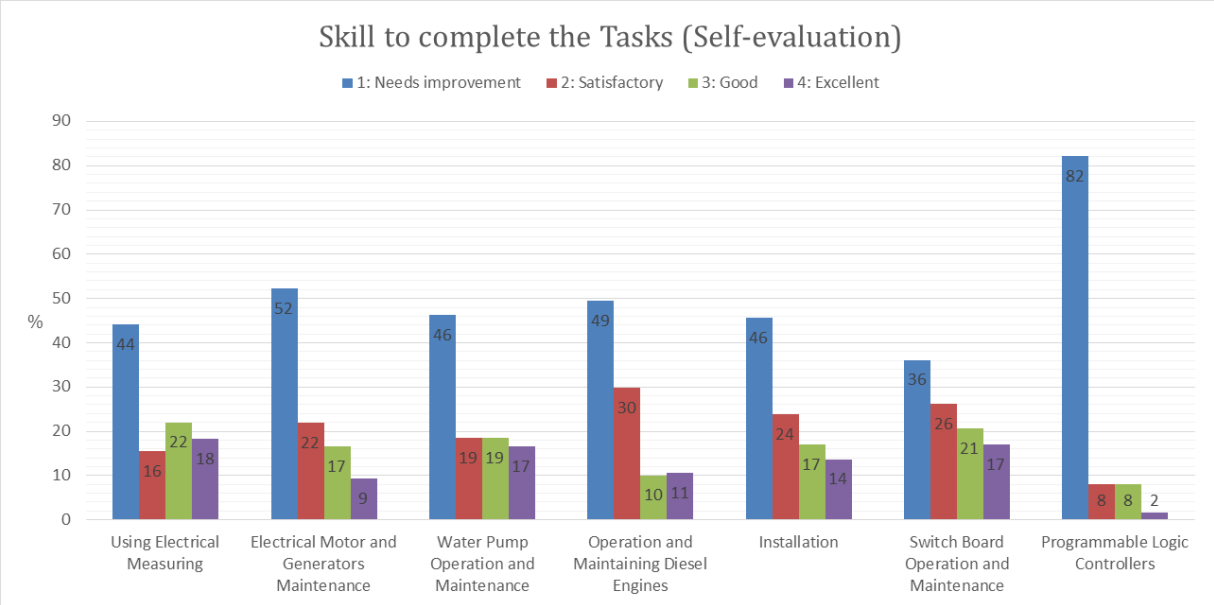
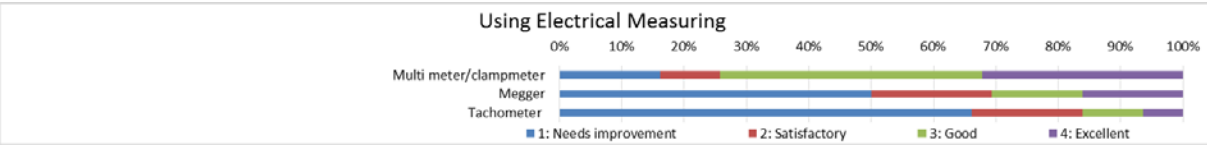
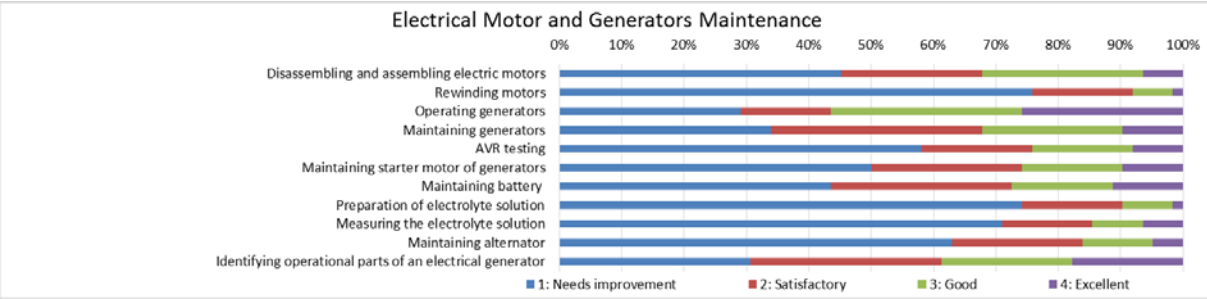
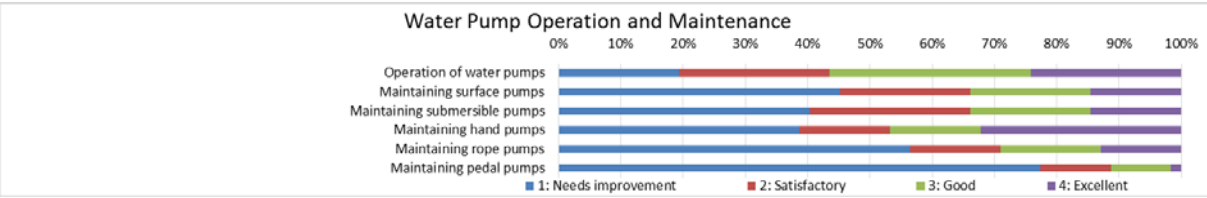
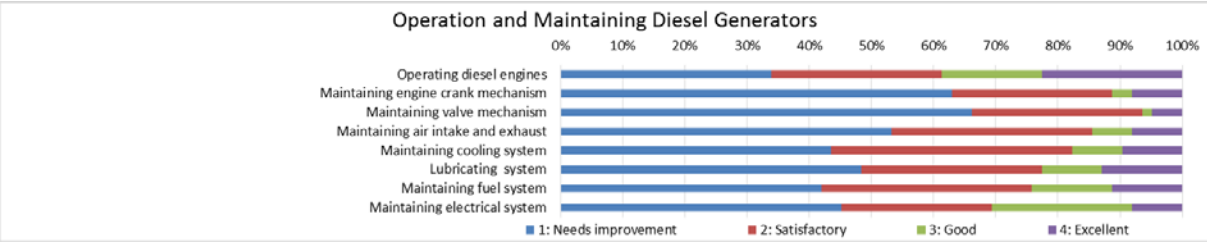


Figure 21: Summary of Questionnaire B for Electro-Mechanical Maintenance Technology









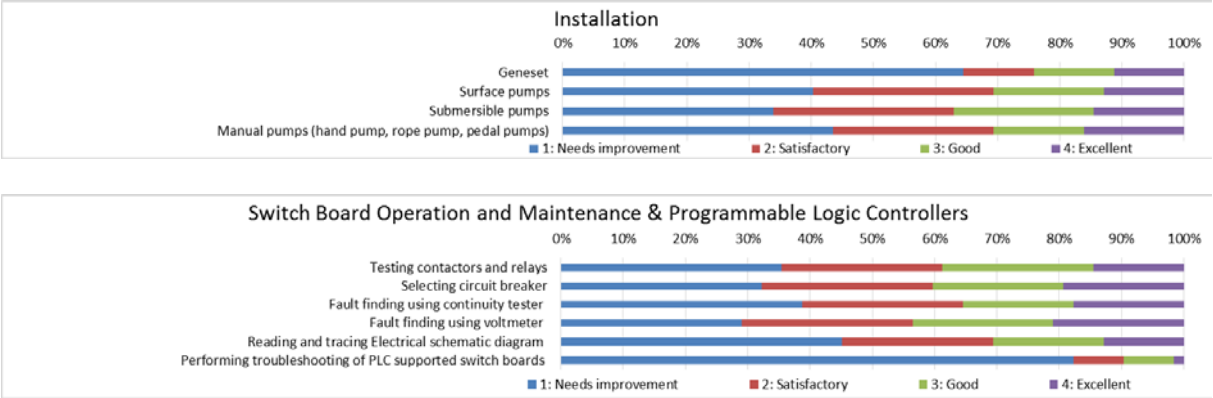


Figure 22: Self-evaluation results for the skill to complete the tasks related to Electro-Mechanical Maintenance Technology

Looking on the modules, all of them show high rate of“Needs improvement”..

When we look in detail of the result of each tasks described in question “B”, the most skill gap shown are in performing the following:

- PLC (programmable logic control)
- Electrical motor and generators maintenance (especially rewinding motors, preparation and measuring electrolyte solutions, maintaining alternator and AVR testing)
- Operation and maintenance of diesel engine (maintaining valve mechanism, engine crank mechanism and air intake and exhaust)
- Water pump operation and maintenance (maintain pedal pumps, rope pumps, surface pumps)
- Installation (Gen-set, manual pumps)
- Using electrical measuring (tachometer, megger)
- Switch board operation and maintenance (trouble shooting of PLC supported switch board, reading and tracing electrical schematic diagram and fault finding using continuity tester)

3.4.4 Level of practical skills of respondents (Direct interview with Checklist)

Direct interview and questioning were conducted based on the checklist prepared and filled by interviewers. The respondents’ level of practical skill as per result of direct interview and checklist are summarized in Figure 23 and Figure 24.

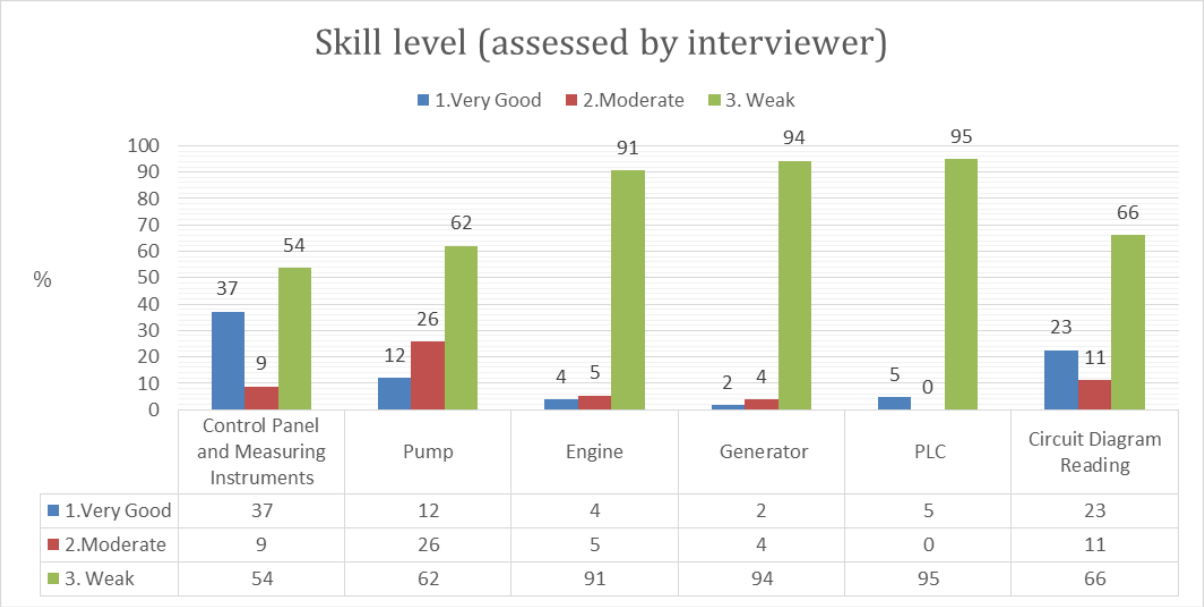


Figure 23: Summary of Checklist for Electro-Mechanical Maintenance Technology

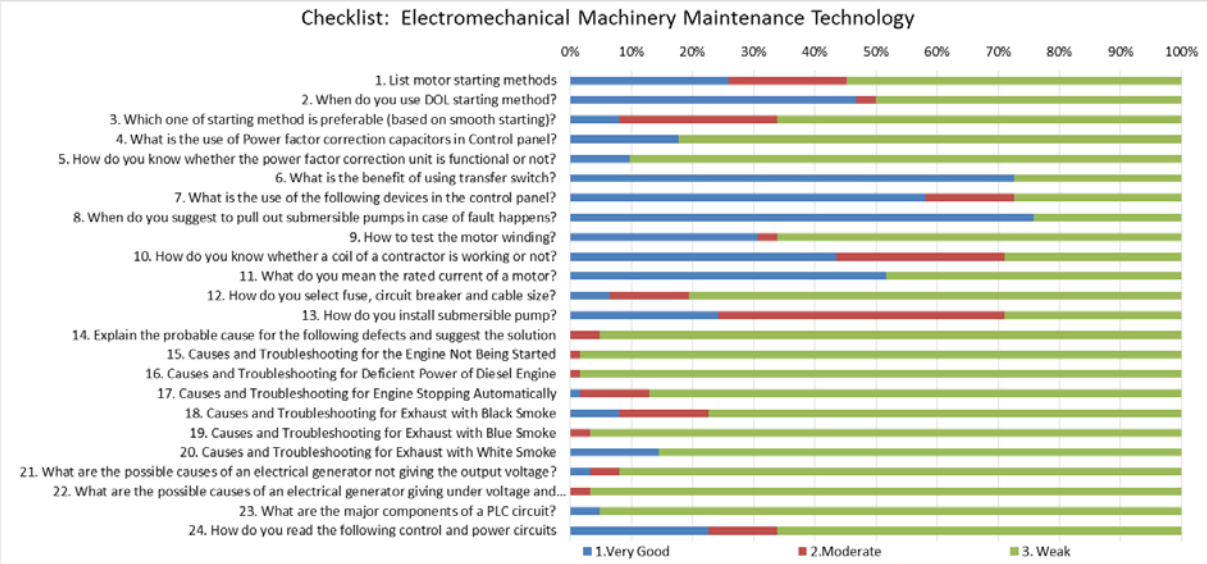


Figure 24: Results of direct observation for the skill level of respondents related to Electro-Mechanical Maintenance Technology

Although the result of the questionnaire A shows that the engagement of work in PLC as well as in operation and maintenance of generator and engines are very low, during direct interview it is observed that this happened due to lack of their skill as well as their lack of exposure to the technology.

Major tasks which showed technical gap among the respondents of the direct interview are:

- Performing PLC (this technology is rapidly expanding especially in switch boards of pumps and generators in the country and this in turn, will create a high demand for skill development.)
- Trouble shooting and maintenance of generator (starter, AVR, alternator, etc.)

- Trouble shooting and maintenance of engine (crank mechanism, fuel system, lubrication and cooling system, etc.)

Other tasks which are raised as high skill gap in Questionnaire B such as the performance with rewinding motors are found considerable as high requirement from the professional point of view.

3.4.5 Group discussion and interview to managers/supervisors

(1) Group Discussion

During the group discussion the participants raised points that contribute for less performance other than technical gap; and these are the following:

- Technicians/engineers assigned other than their profession
- Lack of tools and material
- Lack of experience and exposure on those activities
- Level of education and lack of practical training on the scope

(2) Managerial/Supervisor Interview

Most managers/supervisors responded that they agreed to responses made by the technicians/engineers on questionnaire about the frequently of work engagement with the listed tasks as well as to the responses made to their level of practical skill /questionnaire “B” in performing those tasks. But some managers/supervisors do not accept some tasks especially on skill of their technician/engineer.

The managers/supervisors suggested the following points to improve the skill level of their technicians/engineers:

- Additional and sufficient training time
- Capacitate his skill and knowledge through the training
- Provide the required material
- Coaching, support and follow up
- Attitudinal change and skill upgrade
- Advance training like design and software
- Specialized practical trainings and coaching

3.4.6 Technical gaps and priority subjects to be strengthened

(1) Common technical gap among all target of respondents

The result of analysis of tasks with high skill gap based on direct interview with the support of the results obtained from the remaining survey tools are summarized as follows:

- Performing PLC. There is high skill gap in performing PLC based on Direct Interview and Questionnaire “B”, where as it showed very less engagement according to Questionnaire “A”. However, the professional view for the result of very less engagement in PLC is the high skill

gap or lack of experience with the respondents.

- Performing rewinding motors (especially submersible pumps);
- Trouble shooting and maintenance of generator;
- Trouble shooting and maintenance of engine,
- Installation and maintenance of solar pump

Based on the analysis of the EMMT activities, it is found that the electro-mechanical engineer/technician should have adequate knowledge and skill of both electrical and mechanical aspects.

(2) Specific technical gap observed in RWB and Big Towns

Moreover, skill gap identified other than the tasks stated in questionnaire and interview; the following are suggested by discussion participants in RWB and in some big towns and which are found acceptable:

- Design and technical specification preparation (of electro-mechanical)
- SCADA system and
- Compressor operation and maintenance

4 Conclusion

Although the time allocated for this survey was short, EWTI staff actively participated in planning, implementation, analysis and report writing. All the respondents willingly participated in the completion of the questionnaires and group discussion, which showed high expectation for improvement of EWTI's training program. As a result, the scope of the survey was appropriate to identify technical gap in each organization.

In general, the survey was successful with the following major achievement.

1. Technical gap in specific tasks were identified in the four major technical subjects

   In the Training Needs Assessment (TNA) previously conducted by EWTI staff in early 2017, focus was given only on relative importance of training modules of current EWTI training courses and titles of additionally required training courses through questionnaires. However, more specified technical gap in performing tasks were needed to design detailed contents of training. After the experience of TNA, this Technical Gap Survey was carried out based on specified detailed tasks using different survey tools. In this survey, in addition to questionnaires, direct interview to respondents, group discussion and interview to manager/supervisor were conducted to have more reliable information. These tools were considered appropriate and adequate because the use of only questionnaires which is self-evaluation of the respondents often misleads the result due to some bias reflecting their personal interest rather than actual demands at sites.

2. The skill gap was analyzed by organization types

   Currently EWTI invites trainees from all types of organizations for the same training course for the same profession. However, this survey revealed that there are some differences in their mandates and functions among the organizations. For example, the mandates of Regional Water Bureaus are different from those of Woreda Water Offices. Although they have a lot of common technical gap, the survey results identified some specific technical gap in different organizations under the field of groundwater investigation and electro-mechanical maintenance technology.

3. Common technical gap was identified in different technical subjects

   The survey identified that some working tasks which are used to be considered as the work of a specific profession are actually performed by different professions according to the actual demand in the field. For example, mechanical engineers need to conduct maintenance of electrical parts of mechanical machines, or drillers need to carry out mechanical maintenance of drilling machines, which were generally considered as the works of electrical engineers and mechanical engineers, respectively.

4. Difference in technical gap was observed according to the level of experience

   As per the result of the survey, the difference in skill gap was identified between senior and junior staff. For example senior drillers have gap in more theoretical aspect whereas junior drillers in practical aspect in drilling technology.

Based on the gaps identified through this survey, EWTI is going to plan new training courses as pilot training courses. The data collected in the survey will serve as baseline for future monitoring and evaluation of EWTI training. The same respondents are expected to participate in the planned pilot training courses so that the change in behavior in their working places and its impact to the organization can be properly measured.

EWTI staff who participated in the survey have acquired in depth knowledge and practice in conducting technical gap survey with much interaction with respondents. They experienced using different types of questionnaires and other survey tools such as direct interview with checklist, group discussion and interview to manager/supervisor. Especially the direct interview or direct observation at site was recognized very important because the previous TNA survey depended mainly on the questionnaire results which may not identify specific technical gap. These survey methods are expected to be effectively applied in the similar survey which would be conducted by EWTI staff in the future. The survey report was reviewed and finalized in the workshop organized by EWTI staff with the presence of invited local experts. The survey contributed not only to collect information on skill gap but also to deepen the understanding of the real situation at site for EWTI staff.

5 Lesson learned

The following issues were observed during the implementation and analysis of the survey.

1. Prior to the departure of field work by all the survey groups, possibility of cooperation for the survey was confirmed at each organization through the direct visit (SNNP and Tigray) and discussion by telephone. This arrangement turned out effective to secure respondents in almost all organizations except one technical subject in one organization in Benishangul-Gumuz.
2. All survey groups with exception of EMMT group visited one organization in Addis Ababa (Oromia Drilling Enterprise) together and conducted data collection before all the groups mobilized to the field work, which was quite necessary in order to standardize the survey method among the surveyors and even to prove the functionality of survey tools.
3. The questionnaires were distributed when interviewers visited each organization (not beforehand). This was found appropriate to avoid misunderstanding because respondents required explanation for some questions.
4. Questionnaire A and B used the same list of tasks. However, there was some incompatibility in listed items between the said Questionnaires and Checklist for the direct interview. It would have been easier to analyze the results if there was matching of the subjects to be asked in the three survey tools (Questionnaire A, B and Checklist).
5. The list of tasks under each technical subject was not exhaustive and there were some missing tasks which were important to be asked. These missing tasks were supplementary added during the direct interview as well as group discussion.
6. There was misunderstanding with the wording of the option to be answered by respondents in the self-evaluation of Questionnaire A about frequency of engagement in different tasks. As one of the answering options is written as “No Requirement” and when this option is selected it has two possible meanings. One could be an absence of need for the particular task in their working place and the other could indicate lack of skills to execute this task by the particular respondent. Therefore, this option should be clearly defined like for example “No engagement (no requirement)” and “No engagement (there is requirement but no skill to be engaged)”.
7. The group discussion was planned and executed in the same day of completing the self-evaluation questionnaire A and B as well as responding to direct interview. This was too much burdensome for respondents. Therefore, to get a good result from the group discussion there is a need of appropriate scheduling with adequate time.
8. This survey used questionnaire, interview and discussion but did not have time to observe their actual work at site. It would be more effective and reliable if the survey included direct observation of their practice of work at site. However, in the actual case, it would be still difficult to implement direct observation because of timing, willingness and accessibility issues.

ANNEX

1. Questionnaire A & B for GI, DT, DMMT and EMMT
2. Checklist for GI, DT, DMMT and EMMT
3. Format for Group discussion
4. Format for interview to Manager/Supervisor
5. List of survey team members
6. Photos

ANNEX 1

Questionnaire A &B for GI, DT, DMMT and EMMT

Project for Strengthening Capacity for Training Operation and Management for Ethiopia Water Technology Institute (EWTI)

Technical Gap Survey

Questionnaire: Groundwater Investigation

Target: Department of Water Resource and Drilling Technology Department

Date: _____

Region: _____

Organization: _____

Name of Respondent: _____

Job Position: _____

Education Level of Respondent: _____

Former EWTI/EWTEC Trainee: YES / NO

Q. Assessment of work details and self evaluation of your skill

A. Frequency you are engaged with each type of activity in your work
- *4: Very often (more than once a week)*
- *3: Often (more than once a month)*
- *2: Only sometimes (more than once a year)*
- *1: No requirement (never or less than once a year)*

B. Your skill to complete the work
- *4: Excellent*
- *3: Good*
- *2: Satisfactory*
- *1: Needs improvement*

Course Title	Contents	A				B				Remarks
		4	3	2	1	4	3	2	1	
Groundwater Hydrology	Hydro metrology data acquisition, analysis and interpretation									
	Estimate evapotranspiration									
	Rainfall-runoff relationships									
	Calculate river flow discharge,									
	Performing catchment water balance analysis									
	Hydrograph separation (base flow recession)									
	Estimation of groundwater recharge									
	Estimation infiltration, percolation and storage									
	Conduct the residence time /Isotope hydrology/									
Groundwater Investigation	Preliminary data acquisition, analysis and interpretation									
	Topographic map analysis and interpretation (how topography influence groundwater occurrence)									
	Analysis and interpretation of Digital Elevation Model (DEM)									
	Perform physiography analysis (soil, vegetation cover, relief etc.)									
	Determine drainage pattern relationship with geology and its influence of groundwater occurrence									
	Preparation of geo-hydrochemical maps that indicate the chemical characteristics of groundwater									
	Preparation of geological maps, correlation of stratigraphy, interpretation geology in terms of groundwater potential									
	Identification and mapping of potential groundwater									

	areas (hydrogeological mapping) with groundwater flow direction									
	Analyses interpret regional and local hydrodynamics of groundwater flow, identify deep aquifer									
	Collect remote sensing data (satellite images, aerial photographs) analysis and interpret									
	Perform fracture trace analysis and determine fractures hydrogeological characteristics									
Surface Geophysics	Perform hydro-geophysical mapping;									
	Geophysical well field delineation borehole mapping and geo-pollution studies;									
	Conducting Vertical Electrical Sounding (VES) measurement by Schlumberger arrays.									
	Interpretation using curve matching and/or inversion to assess thickness of the subsurface layers changes in lithology and depth to water table.									
	Estimate depth of water well drilling.									
	Conducting profiling measurement by different array (Wenner, Schlumberger etc. array). And assess lateral changes in subsurface condition at a constant dimension of potential and current electrode).									
	Writing Geophysical report for profiling and sounding survey									
	Conduct 2D electrical imaging surveys.									
	Performing pseudo section data plotting using Pseudo section contouring method									
	Calculate the apparent resistivity Pseudo section for a user defined 2-D subsurface model using software program RES2DMOD.EXE.									
	Writing Geophysical report for electrical imaging surveys.									
	Conducting measurement of conductivity of the subsurface in Time domain electromagnetic (TDEM) with a receiver and transmitter unit.									
	Interpretation method for determination of thickness and conductivity of subsurface rock using TDEM method									
	Writing Geophysical report for Time domain electromagnetic (TDEM) method.									
Borehole Geophysics	Conduct logging such as resistivity log, Caliper log, spontaneous potential log, gamma-gamma log									
	Perform data processing and interpretation of geophysical logging									
Geochemistry	Collect water samples, analysis and interpret characteristics of water (physical, chemical and biological using software)									
	Determine quality of water for different uses (agricultural, domestic, industrial etc.)									
	Performing groundwater quality mapping									

	Applying of water quality standard and use									
	Define controlling factors of evolution of water chemistry									
	Determine groundwater flow direction from geochemistry/ Isotope hydrology									
Groundwater Development and Management										
Water Well Management	**Drilling Technology**									
	Identify drilling machineries									
	Determine drilling technics in different geologic formation									
	Explain purpose of rotary drilling techniques advantage and disadvantage (Air Rotary Drilling Method, Mud Rotary Drilling Method, Down the Hole (DTH) Drilling) • Direct Rotary Techniques (direct circulation) • Reveres Rotary Techniques (reverse circulation)									
	Decide drilling bit types and function (percussion, rotary, DTH bits)									
	Identify and application of Drilling Fluids used in drilling (Clear water, Compressed air, Foam, Water based mud)									
	Perform formation sampling, geological logging, geophysical logging									
	Perform well design									
	Identify functions of different kinds of casing and installation									
	Explain gravel packing, well head construction and & cement grouting									
	Drilling Supervision									
	Supervise water well drilling supervision sequence of the work									
	Supervise well construction procedures									
	Applying professional ethics									
	Contract Administration									
	Identify types of Contracts, Basic Components of Contract Agreement									
	Relations Among the Different Parties									
	Explain, undertand and relate laws and policies (the water policy, the health and sanitation policy, Environmental policy, Construction works policy, Science and Technology policy etc.)									
	The Standard Condition of Contracts									
	Bidding Procedures, Evaluation of Proposals									
	Well Rehabilitation									
	Supervise well rehabilitation and maintenance									
	Determine redevelopment with well-development techniques. • Mechanical Rehabilitation Brushing Surge blocks, High-Velocity Jetting									

	• Chemical Rehabilitation Acid Treatment Chlorine, Hypo chlorites (Ocl), Acid Treatment, hydrochloric (HCI), sulfamic (NH2SO3H), hydroxyacetic (HOCF12COOH**).** • Structural repairs Deepening the well									
Pumping test	Know basic principles of pumping test method									
	Conduct provisional, step draw down, constant discharge and recovery pumping test method									
	Collect pumping test data, analysis and interpret									
	Calculate hydraulic property of aquifer and well efficiency									
	Identify aquifer type, yield									
	Determine/ decide pump position in the well									
	Conduct basin pumping test									
	Estimation of basin discharge									
	Determine ground water flow direction									
Groundwater Modelling	Understand basic groundwater modelling									
	Plan and make outline of modeling									
	Collect and prepare data for modeling									
	Design model framework									
	Input data and performing simulation									
	Perform model calibration									
	Demonstrate the result and applications									
	Writing report of Modeling									

Questionnaire: Drilling Technology

Target: Drilling Technology Department

Date: _____

Region: _____

Organization: _____

Name of Respondent: _____

Job Position: _____

Education Level of Respondent: _____

Former EWTI/EWTEC Trainee: YES / NO

Q. Assessment of work details and self evaluation of your skill

A. Frequency you are engaged with each type of activity in your work

- *4: Very often (more than once a week)*
- *3: Often (more than once a month)*
- *2: Only sometimes (more than once a year)*
- *1: No requirement (never or less than once a year)*

B. Your skill to complete the work

- *4: Excellent*
- *3: Good*
- *2: Satisfactory*
- *1: Needs improvement*

Course Title	Contents	A				B				Remarks
		4	3	2	1	4	3	2	1	
Introduction to Geology and Hydrogeology	Concept of geology and Ground water									
	Concept of ground water investigation									
	Understanding concept of Standard well design									
	Performing Formation sampling									
	Performing well logging									
	Performing Pumping Test									
Unit of measurement	Basic unit conversion									
	Understanding basic mathematical formula related to drilling									
Drilling Administrative Techniques	Applying safety precautions									
	Performing Drilling plan and schedules									
	Applying well organization team work in drilling									
Drilling machine and Tools	Understanding Types of Drilling Machine and Equipment									
	Differentiate and selecting Drilling Bits									
	Differentiate and selecting Rotary and percussion Drilling Tools									
	Install Casing and screen									
Drilling Techniques	Drilling preparation on cable tool drilling technique									
	Performing drilling operation on cable tool machine									
	Drilling preparation on DTH(Air- Hammer) drilling technique									
	Performing drilling operation on DTH(Air- Hammer) drilling machine									

Project for Strengthening Capacity for Training Operation and Management for Ethiopia Water Technology Institute (EWTI)

Technical Gap Survey

	Drilling preparation on Rotary drilling technique									
	Performing drilling operation on Rotary drilling machine									
	Understanding and preparing Drilling Fluid Technology									
	Performing well construction									
Function of Drilling Machines and Basic Welding and Cutting	Understanding function of drilling machine									
	Understanding and operating Hydraulic system									
	Able to know symbols of Hydraulic component									
	Understanding Hydraulic pumps									
	Performing welding and cutting									
Data Collection Reporting	Well logging ,(Drilling & Litho logical)									
	Preparing well completion Report									
	Collecting well pumping test data.									
Troubleshooting	Identifying common drilling problems									
	Differentiate and applying fishing tools									
	Solving various cases /problems/ occurring on water well drilling									

Project for Strengthening Capacity for Training Operation and Management for Ethiopia Water Technology Institute (EWTI)

Technical Gap Survey

Questionnaire: Drilling Machinery Maintenance Technology

Target: Water wells Drilling Enterprise and Organization for DMMT Engineers & Technicians

Date: _____

Region: _____

Organization: _____

Name of Respondent: _____

Job Position: _____

Education Level of Respondent: _____

Former EWTI/EWTEC Trainee: YES / NO

Q. Assessment of work details and self evaluation of your skill

A. Frequency you are engaged with each type of activity in your work

4: Very often (more than once a week)
3: Often (more than once a month)
2: Only sometimes (more than once a year)
1: No requirement (never or less than once a year)

B. Your skill to complete the work

4: Excellent
3: Good
2: Satisfactory
1: Needs improvement

Course Title	Contents	A				B				Remarks
		4	3	2	1	4	3	2	1	
Diesel Engine Operation and Maintenance	Maintaining engine crank mechanism									
	Maintaining valve mechanism									
	Maintaining air intake and exhaust									
	Maintaining cooling system									
	Maintaining lubricating system									
	Maintaining fuel system									
	Maintaining staring aid of engine									
	Maintaining over all engine components									
	Maintaining common rail EFI diesel engine									
	Maintaining and checking ECM engine sensors and by using diagnoses scan tools									
Percussion (cable) Tools Rig Operation and Maintenance	Identifying cable tools (percussion) rigs components									
	Carry out operation principles of cable tools rig									
	Performing spudding mechanism, Bull reel, calf reel, Sand reel & Derrick hoist forward and reverse direction Power train mechanism and operation principle.									
	Plan preventive and schedule maintenance & its spare									
	Trouble shooting & Maintaining percussion rigs.									
	Preparing technical specification of rotary drilling rigs									
	Perform operation principle of drilling rigs main components (Mast & mast rising cylinder, Drill head, Pull down cylinder, Mud pump, Foam pump, Draw works, Sand reel, Leveling jacks, power tong, hammer oil pump, Rig carrier truck									
	Perform operation principle of hydraulic system,									

THD Rotary Drilling Rig Operation and Maintenance	hydraulic oil, tank, pump, motor, cylinder, control valves, hydraulic filters, lines, hoses, seals, gauges									
	Planning preventive and schedule maintenance & its spare									
	Maintaining THD Rotary gear box and water swivel									
	Maintaining Pull down cylinder, chains & sheaves									
	Maintaining Hydraulic components (hydraulic oil, tank, pump, motor, cylinder, control valves, hydraulic filters, lines, hoses, seals, gauges)									
	Maintaining Mast cylinder, leveling jacks & power tong									
	Maintaining Mechanical and Hydraulic winch									
	Maintaining Mud pumps and systems									
	Maintaining Foam injection pump systems									
	Perform Reading practice on THD rotary drilling rig hydraulic circuits and electrical circuit									
	Perform Trouble shooting and maintenance of rigs									
Air Compressor Operation and Maintenance	Identifying types of air compressor & its operation system									
	Perform operation principle of air compressors main component									
	Maintaining compressor driving, air, oil & regulating System components									
	Perform reading practice of pneumatic circuit									
	Identifying Electrical system of air compressor									
	Perform operation principle of electrical parts of Compressor									
	Perform Reading practice on air compressor electrical circuits									
	Planning preventive and schedule maintenance & its spare									
	Perform Trouble shooting and maintenance of air Compressor									
DTH Air Hammer Operation and Maintenance	Identifying types of air hammer & its operation system									
	Perform operation principle of air hammer main component									
	Perform Trouble shooting and maintenance of DTH air hammer									

Project for Strengthening Capacity for Training Operation and Management for Ethiopia Water Technology Institute (EWTI)

Technical Gap Survey

Questionnaire: Electro-Mechanical Maintenance Technology

Target: Department of electromechanical maintenance Technology

Date: _____

Region: _____

Organization: _____

Name of Respondent: _____

Job Position: _____

Education Level of Respondent: _____

Former EWTI/EWTEC Trainee: YES / NO

Q. Assessment of work details and self evaluation of your skill

A. Frequency you are engaged with each type of activity in your work

4: Very often (more than once a week)
3: Often (more than once a month)
2: Only sometimes (more than once a year)
1: No requirement (never or less than once a year)

B. Your skill to complete the work

4: Excellent
3: Good
2: Satisfactory
1: Needs improvement

Course Title	Contents	A				B				Remarks
		4	3	2	1	4	3	2	1	
Using Electrical Measuring	Multi meter/clampmeter									
	Megger									
	Tachometer									
Electrical Motor and Generators Maintenance	Disassembling and assembling electric motors									
	Rewinding motors									
	Operating generators									
	Maintaining generators									
	AVR testing									
	Maintaining starter motor of generators									
	Maintaining battery									
	Preparation of electrolyte solution									
	Measuring the electrolyte solution									
	Maintaining alternator									
	Identifying operational parts of an electrical generator									
Water Pump Operation and Maintenance	Operation of water pumps									
	Maintaining surface pumps									
	Maintaining submersible pumps									
	Maintaining hand pumps									
	Maintaining rope pumps									
	Maintaining pedal pumps									
Operation and Maintaining Diesel Generators	Operating diesel generators									
	Maintaining engine crank mechanism									
	Maintaining valve mechanism									
	Maintaining air intake and exhaust									

	Maintaining cooling system									
	Lubricating system									
	Maintaining fuel system									
	Maintaining electrical system									
Installation	Geneset									
	Surface pumps									
	Submersible pumps									
	Manual pumps (*hand pump, rope pump, pedal pumps*)									
Switch Board Operation and Maintenance	Testing contactors and relays									
	Selecting circuit breaker									
	Fault finding using continuity tester									
	Fault finding using voltmeter									
	Reading and tracing Electrical schematic diagram									
Programmable Logic Controllers	Performing troubleshooting of PLC supported switch boards									

ANNEX 2

Checklist for GI, DT, DMMT and EMMT

Check List for Groundwater Investigation

Date: _____

Region: _____

Organization: _____

Name of Respondent: _____

Job Position: _____

Education Level of Respondent: _____

Former EWTI/EWTEC Trainee: YES / NO

PART I : Groundwater and Hydrology

1. Describe the water balance equation for a catchment

The water balance equation for a catchment

$$P - R - G - ET = \Delta S$$

- ☐ where P - precipitation, R - river runoff, G - groundwater runoff/infiltration, ET - evapotranspiration, ΔS - storage change in a catchment

PART II : Groundwater Investigation and Methodology

2. What are the procedures of groundwater investigation?
   - ☐ Office level ;Include data collection and study:
     - ☐ Existing water- well data,
     - ☐ Aerial photos and Satellite image analysis and interpretation (Remote sensing)
     - ☐ Topographic map and Digital Elevation Model (*DEM*) interpretation,
     - ☐ Geological and hydrogeological maps analysis and interpretation
     - ☐ Geo-hydro chemical maps interpretation
     - ☐ Water Use data
     - ☐ Written reports analysis
     - ☐ Hydro meteorological data
   - ☐ Field level detail investigation (Topography, geology and hydrogeology, geological structures, existing boreholes, hydrology, use of geophysical methods

3. What are those factors that control/affect ground water recharge and occurrence?
   - ☐ Topography
   - ☐ Type of Geology
   - ☐ Precipitation (magnitude, intensity, duration, spatial distribution)
   - ☐ Runoff and ponding of water
   - ☐ Irrigation (nature of irrigation scheduling, losses from canals and water courses, etc.)
   - ☐ Rivers (rivers flowing into and leaving out of the area under consideration, rivers gaining water from or losing water to the aquifer, etc.). Hydro geological property of rocks
   - ☐ Existence of primary /secondary porosity of rocks resulted from
     - ☐ porosity of rocks formed during genesis
     - ☐ Post genesis degree of weathering and fracturing
   - ☐ Soil zone (nature of the soil, depth, hydraulic parameters, variability of the soil spatially and with depth, rooting depth of the soil, and cracking of soil on drying out or swelling due to wetting)
   - ☐ Unsaturated zone between soil and aquifer (flow mechanism through unsaturated zone, zones with different hydraulic conductivity, etc.)
   - ☐ Ability of aquifer to accept water and variation of aquifer condition with time
   - ☐ Vegetation cover

4. What is the purpose of Geographic Information System (GIS) in groundwater resource management?
   - ☐ GIS used to management of natural resources including groundwater resources
   - ☐ It helps to create groundwater resource data base: automating and gathering data for the database, and managing the database
   - ☐ Analyze the data: ranges from simple mapping to creating complex spatial models. A model is a representation of reality used to simulate a process, predict an outcome, or analyze a problem.
   - ☐ Present the results: the results of a GIS analysis can best be shown on a map.

PART III : Geophysical Groundwater Investigation Methodology

5. What are the main geophysical groundwater investigation methodology mostly used in Ethiopia?

- ☐ Electrical resistivity survey (vertical electrical sounding(VES) and profiling

6. Have you ever conducted Electrical resistivity survey (vertical electrical sounding(VES) and profiling?
   - ☐ Yes
   - ☐ No

   If yes, next question (Q7) will be asked

7. What are the arrays (electrode layouts) we use in resistivity surveys? Which method and array are often used in geophysical groundwater investigation for well site selection in Ethiopia?Why?
   - ☐ Schlumberger, Wenner, Dipole-Dipole, pole-pole, Three-Pole, pole-dipole
   - ☐ VES with Schlumberger is most common, conducted to reach deeper and deeper beds while Profiling is for Investigation of the subsurface in a lateral direction

8. How do you manually plot a field data obtained from Vertical Electrical sounding (VES), how do you, analyze and interpret?
   - ☐ The electrical sounding survey results are presented in form of graphs (The scale on both sides -vertical & horizontal is logarithmic), where half-length of the array (AB/2) is plotted on the abscissa (horizontal axis) and the corresponding apparent resistivity values are (ρa) is plotted on the ordinate (vertical axis)
   - ☐ VES interpretation comprises curve matching between the VES curves obtained from the field and VES curves computed for assumed theoretical models (this method involves a comparison of measured curve with a set of theoretically calculated master curves) the auxiliary point method, automatic forward and inversion methods

9. What are the purposes of geophysics in hydrogeology?
   - ☐ It helps to map the near subsurface geology under extensive soil cover (overburden).
   - ☐ It allows acquiring information about the extension of important geological features both laterally and vertically
   - ☐ Assess/explore areas for groundwater potential
   - ☐ Study the qualitative characteristics of water-bearing formations and conduct quantitative evaluations;

- Delineating fresh-saline water interfaces and evaluate degrees of mineralization
- Estimate depth of impermeable beds and map their morphological trends
- Study the dynamicity of groundwater (velocity/ movement and its flow direction)
- To identify/delineate structurally weak zones (like faults, fracture zones and fissures) that usually serve as conduits for the groundwater to flow into or out of the aquifers

10. What are the applications of geophysical Well logging?

    Well logging methods comprise of set geophysical methods applied to;

    - Assessment of physical properties of fluids filling the boreholes and pores and fractures of the rock (resistivity, density, porosity, etc)
    - Recognition of basic geological conditions in rocks penetrated by drilling
    - Identify potential productive zones
    - Helps Well design
        - To evaluate the location and condition of blind casing and screen casing

11. What is the application of 2-D electrical imaging surveys? What are the procedures?

    - The limitation of the resistivity sounding method is that it does not take into account horizontal changes in the subsurface resistivity. A more accurate model of the subsurface is a two-dimensional model (2-D) where the resistivity changes in the vertical direction, as well as in the horizontal direction along the survey line.
    - A 2-D electrical imaging surveys carried out using a large number of electrodes connected to a multi-core cable. A laptop microcomputer together with an electronic switching unit is used to automatically select the relevant four electrodes for each measurement.
    - The sequence of measurements to take, the type of array to be used and other survey parameters (such the current to use) is normally entered into a text file which can be read by a computer program in a laptop computer
    - Then performing pseudo section data plotting using Pseudo section contouring method Calculate the apparent resistivity Pseudo section for a user defined 2-D subsurface model using software program RES2DMOD.EXE.

PART IV : Water Well Management

12. What are those activities need to be supervised during water well drilling?
    - ☐ Mobilization of manpower, Drilling Rigs, tools and accessories to the site
    - ☐ Construction of access road from main or auxiliary road to drilling site
    - ☐ Site clearing and preparation
    - ☐ Drilling in all formation
    - ☐ Supply Installation and Constructing casing (Kinds and quality)
        - ☐ Steel blind surface casing
        - ☐ Blind and steel screen casing
        - ☐ PVC blind and Screen casing
    - ☐ Vertical alignment and Plumbness
    - ☐ Observation pipe installation
    - ☐ Supply and pack selected river gravel
    - ☐ Supply and cement grouting
    - ☐ Well head construction
    - ☐ Supply and weld iron sheet metal on top of bore hole and well labeling.
    - ☐ Well development
    - ☐ Conduct step Draw Dawn Test
    - ☐ Conduct step continuous pumping test
    - ☐ Monitoring recovery
    - ☐ Geophysical Resistivity well logging
    - ☐ Chemical analysis of water samples

13. What are the most common types of drilling techniques?

    <u>There are two major types of drilling rigs:</u>
    - ☐ Percussion (Cable tools) Rigs
    - ☐ Rotary (Air/Mud) Rigs
        - ☐ Table rotary type
        - ☐ Top head drive rotary type
        - ☐ Spindle rotary type
        - ☐ Auger rotary type

There are three drilling methods:

- ☐ Rotary drilling
  - ☐ Mud rotary drilling
  - ☐ Air rotary drilling
- ☐ Down the hole hammer drilling
- ☐ Reverse circulation drilling

14. What are common types of drilling fluids?

Mud drilling

- ☐ Water base drilling fluid bentonite
- ☐ Polymers (for thickening)
- ☐ Polyphosphates (for thinning)

Air drilling

- ☐ Foam

15. Describe importance of drilling fluid?

- ☐ Cleaning cutting from the face of the bit
- ☐ Transporting cutting to the ground surface
- ☐ Cooling the drilling bit and drilling assembly
- ☐ Lubricating the drill bit and drilling rods
- ☐ Controlling formation pressure
- ☐ Increasing the stability of the borehole
- ☐ Cutting Separation & Improving sample recovery
- ☐ Suspending the cuttings inside the hole during drill pipe changing
- ☐ Minimizing drilling fluid losses into the formation
- ☐ Facilitating freedom of movement of the drilling string and casing
- ☐ Reducing wear and corrosion of the drilling equipment
- ☐ The presence of fluid reduces the coefficient of friction and dissolve any rotational heat generate

PART V : Water Well Maintenance and Rehabilitation

16. What are the causes of water well deterioration?

- ☐ Incrustation due to groundwater chemical solution
- ☐ Screen clogging

- ☐ Befouling due to iron bacteria
- ☐ Improper design of the well
- ☐ Decrease of the discharge capacity of the well

17. What are well development methods?
    - ☐ Over pumping
    - ☐ Back washing
    - ☐ Mechanical surging
    - ☐ Swabbing
    - ☐ Double flange swab
    - ☐ Air development
    - ☐ High velocity jetting

PART VI : Groundwater Hydrology Modelling

18. Describe groundwater modeling and its use?
    - ☐ The use of aquifers is increasing as both source of water supply and medium for sorting various hazardous wastes.
    - ☐ Numerical groundwater modeling is a tool that can aid in studying groundwater problems and can help understanding of groundwater systems.
    - ☐ A mathematical model simulates groundwater flow indirectly by means of governing equations that represent the physical processes that occur in the system.
    - ☐ groundwater models can be used for resource assessment and resource management at regional scale

    Use of Groundwater Modelling

    - ☐ Groundwater Resource Evaluation
    - ☐ Groundwater Resource Development Planning
    - ☐ Land Subsidence Control (caused by over abstraction of water from well field)
    - ☐ Quality Control (contaminant distribution/ transport to aquifer)
    - ☐ Groundwater Basin Management

19. What are the kinds of data critically important in groundwater modeling need to

be Collected & Investigated?

- ☐ Existing Well Data
- ☐ Existing GW Data /report
- ☐ Existing Geologic & Hydrologic Data/map
- ☐ Geophysical Survey data
- ☐ Groundwater Use Survey
- ☐ Hydro meteorological data

PART VII : Pumping Test

20. Describe kinds of pumping test? And describe importance of each?

- ☐ Pretest (provisional test)
- ☐ Step draw down test
- ☐ Constant discharge test
- ☐ Recovery test

Pretest (provisional)

- ☐ To decide whether the drilled depth is enough or not
- ☐ To decide whether the borehole is abounded or productive
- ☐ To estimate the possible discharge of the well
- ☐ To check the maximum anticipated draw down of the water level and to see its speed
- ☐ To decide the pump position for the next stage of test
- ☐ To choose the type of test and its duration
- ☐ To decide on the best method to measure the yield

Step draw down test

- ☐ To estimate well performance and efficiency
- ☐ To determine the hydraulic characteristics of the well, i.e., to calculate aquifer and well losses
- ☐ To determine a suitable discharge rate for the constant rate test
- ☐ To check or look at fracture positions or main water strike
- ☐ To determine draw down to estimate pump position

Constant discharge test

- ☐ Constant discharge test is performed by pumping the well for a significant length of time with a constant rate
- ☐ To determine the sustainable abstraction rate
- ☐ To determine the aquifer parameters, T, S, Sy etc
- ☐ To collect groundwater samples for field and further laboratory analysis

Recovery test

- ☐ At the end of the last step draw down test and the constant rate test, usually recovery measurements must be taken
- ☐ When the pump is shut down after a pumping test, the water levels in the well and the peizometers will start to rise. This rise in water levels is known as Residual drawdown, (S`). It is expected as the difference between the original water level before the start of pumping and the water level measured at a time (t`) after the cessation of pumping.
- ☐ Recovery tests should not be omitted because they help to verify the accuracy of the pumping data and assist to confirm the results of the aquifer parameters determined by the constant test.
- ☐ Residual drawdown data are more reliable than pumping test data because recovery occurs at a constant rate, whereas a constant test discharge during pumping is often difficult to achieve in the field.
- ☐ Recovery test measurements allow the transmissivity of the aquifer to be calculated, thereby providing an independent check on the results of the pumping test, although costing little in comparison the pumping test.
- ☐ The analysis of a recovery test is based on the principle of superposition. Applying this principle, we assume that, after the pump has been shut down, the well continues to be pumped at the same discharge as before, and that an imaginary recharge, equal to the discharge, is injected into the well

PART VIII : Geochemistry

21. What are Characteristics of water quality?
    - ☐ Physical characteristics
    - ☐ Chemical characteristics
    - ☐ Biological characteristics

22. What are the physical characteristics of water?
    - ☐ Temperature
    - ☐ Turbidity
    - ☐ Color
    - ☐ Taste
    - ☐ Odor

Check List for Drilling Technology

Date: _____

Region: _____
Organization: _____
Name of Respondent: _____
Job Position: _____
Education Level of Respondent: _____
Former EWTI/EWTEC Trainee: YES / NO

PART I : Introduction to Geology and Hydrogeology

1. What are the common rocks you know in the field?
   - ☐ The extrusive are basalt, rhyolite, pumice, ignimbrite, scoria, obsidian, tuff
   - ☐ The intrusive are granite, diorite, gabbros

2. What is weathering and what is erosion?
   - ☐ The decomposition and disintegration of rocks and minerals at the earth surface
   - ☐ The removal of weathered rocks by water, glaciers, wind and gravity

3. What is aquifer?
   - ☐ It is water bearing formation or formations that store and transmit water

PART II : Unit of Measurement

4. Describe the importance of the unit measurement in drilling?
   - ☐ They are used to measure the depth of the borehole.
   - ☐ They help to know the diameter of the borehole.
   - ☐ We can measure the viscosity of the mud.
   - ☐ We can apply to control the uphole velocity of the drilling fluid.
   - ☐ They are useful to measure the torque
   - ☐ They are applied to measure the volume of mud contain in the pit, and well
   - ☐ We can measure the density of the fluid during drilling
   - ☐ We can measure the heat of the fluid in the hole, oils and lubricants.

PART III : Drilling Administrative Techniques

5. What is safety and the safety you apply in the water well drilling work?
   - ☐ Safety is a state of mind creating safe working conditions.
   - ☐ Read and observe all the danger warnings and safety rules regarding work issued by the manufacturer
   - ☐ The operator must be taught and instructed on the operation of the rig before working autonomously.
   - ☐ The operator must be experienced in jobsite work so that he can coordinate his own work with that of the other personnel
   - ☐ It is strictly forbidden to use the machine for other uses than its designed applications (see the machine general description).
   - ☐ During re-fuelling, checks and maintenance as well as in all the periods in which there may be oil or fuel leakages, any polluting of the ground environment must be avoided.
   - ☐ Take great care of the positions of electrical wires and other possible obstructions when the mast in placed into the vertical position.
   - ☐ Before beginning work, thoroughly inspect the terrain and evaluate every eventual risk and danger.
   - ☐ Maintain the safety distance from other machines working in the same jobsite
   - ☐ Be aware of the presence of soft ground in the vicinity of walls; be aware of soft ground near walls which have just been raised; the significant weight of the drilling rig could cause the wall to collapse
   - ☐ Avoid crossing or jumping over obstacles e.g. ground irregularities, heaps, tree trunks, steps, ditches, crags and tracks
   - ☐ During reverse gear, always look in the direction you are going
   - ☐ Ensure that you are aware of the load limits for ground, floor and access ramps
   - ☐ Idle works if anyone approaches the working radius of the rig, and/or stop works in case of emergency.
   - ☐ Do not supply voltage to cables that are twisted so as to avoid any a normal strain that could lead to the breakage of the twisted part
   - ☐ Do not get into or out of the machine when it is moving
   - ☐ Always wear protective gloves when handling cables
   - ☐ Always wear clothes that will not get caught up in levers and moving parts
   - ☐ Stop the machine and disengage all the controls before abandoning the working position in the cabin or before leaving the machine unattended

- ☐ Pull up the drill strings up to the safety position from the bottom of borehole to avoid the caving when drilling works are completely stopped.
- ☐ When using the winches, never exceed the maximum limit described in the technical characteristics
- ☐ The auxiliary winch must not be used to lift objects that are not aligned with the vertically of its cable rope
- ☐ Maintain the control position free from any foreign obstacles
- ☐ Do not transport people inside the machine
- ☐ Adhere to the rest of the safety information stated in the rig manual

PART IV : Drilling Plans, Schedule and Team Organization

6. What are the drilling plan schedule and team organization in office and in field?
   - ☐ Check the road if it is suitable to the rig (bridge, gullies, gorges)
   - ☐ Availability of water for drilling
   - ☐ Availability of fuel
   - ☐ Easily communicable with the office (telephone, fax, bank)
   - ☐ After checking the site and returning back to the office Preparing a check list
     - ☐ Camping facilities based on the crew members
     - ☐ Choosing the kind of the rig according to the drilling depth and diameter
     - ☐ The total number of drilling pipes according to the depth
     - ☐ The type and number bits according to the drilling diameter
     - ☐ The type of casing, diameter and other inputs
     - ☐ The drilling fluids type based on the drilling method
     - ☐ Rig is serviced or maintained properly before mobilization
     - ☐ Availability of crew car, truck for drilling accessories loading

7. At arriving in the field what is your plan given to the crew?
   - ☐ Division of labor shall be given
   - ☐ Erection of camping
   - ☐ Greasing, lubricating, tightening bolts and nuts
   - ☐ Checking oil, water and other lubricants in the compressor, hydraulic pumps diesel engine.
   - ☐ Rigging up the rig according the topography and reflection of sun
   - ☐ Arranging the drilling accessories in front of the rig properly
   - ☐ Prepare mud pit for mud or collapsible plastic bag for foam mixing
   - ☐ Bringing water for mixing and other facilities

PART V : Drilling Machines and Tools

8. What types of rigs you works in the field?
   - ☐ Percussion rig
   - ☐ Spindle rotary rig
   - ☐ Table rotary rig
   - ☐ Top head driving rig

PART VI : Drilling Technology

9. What is the important function of drilling bits?
   - ☐ Penetrating
   - ☐ Crushing
   - ☐ Reaming
   - ☐ Mixing

10. To avoid drilling crooked wells which drilling tools you use?
    - ☐ Collars and stabilizers ,They help to give weight to the bit and maintain straightness of the well

11. Type of drilling fluids ,their use and preparation of drilling fluids
    - ☐ Types
      - ☐ Water base drilling fluid bentonite
      - ☐ Polymers (for thickening)
      - ☐ Polyphosphates (for thinning)
      - ☐ Foam
    - ☐ Uses
      - ☐ Lubricating and cooling the drill pipe and bit
      - ☐ Cutting transportation
      - ☐ Stabilizing the wall of the well
      - ☐ Avoid loosing mud into natural or induced crack
      - ☐ Reducing the density of the water by forming foam
      - ☐ Carrying out the cutting by suspending on the foam
    - ☐ Preparation
      - ☐ With jet hopper mixers
      - ☐ Mechanical shear mixers

12. How do you control the bit weight in different formation?

- ☐ If the formation is soft the load is minimum and the rotation will be fast
- ☐ If the formation is hard the load is high and the rotation will be low

PART VII : Data Collection and Report Preparation

13. What are the daily drilling reports contain?
    - ☐ Region, Zone, woreda, village, sit name
    - ☐ Project owner, and type of project
    - ☐ Mobilization and demobilization date
    - ☐ Drilling commencement and finishing date
    - ☐ Crew members name and position
    - ☐ Daily drilling depth and diameter
    - ☐ Daily drilling inputs consumption (water, foam, bentonite, oil, lubricants and fuel)
    - ☐ Brake down of machine and the maintained part
    - ☐ Casing type and installation
    - ☐ Amount of gravel used and development
    - ☐ Drilling problems and counter measures taken
    - ☐ Any visitor that come to the drilling site and purpose
    - ☐ Break of tools or bits
    - ☐ Use various types fishing tools recover the dropped and stack tools

PART VIII : Troubleshooting

14. What are the common problems in the drilling?
    - ☐ Borehole collapse
    - ☐ Circulation loss
    - ☐ Drop of tools
    - ☐ Stacking of tools
    - ☐ Bridging

15. What are the type of fishing tools you applied in the field?
    - ☐ Male and female taper taps (for hollow tubes)
    - ☐ Die over shot used and are attached to drill pipe or tubing and lowered over the outside of pipe lost or stuck in the borehole
    - ☐ Magnets are great for retrieving tooling that has been broken into pieces Junk Mill Bits are commonly used for drilling through lost tooling, bridge plugs, packers, cement.

- ☐ Basket fish for recovery of the dropped rotary bits

16. What measure do you take when you face problems?
    - ☐ Use appropriate drilling method and drilling fluids (collapse)
    - ☐ Utilizing temporary service casing to avoid collapse
    - ☐ Apply circulation loss sealant fluids and materials

PART IX : Waterwell Maintenance and Rehabilitation

17. What are the methods you apply to restore the well?
    - ☐ Over pumping
    - ☐ Back washing
    - ☐ Mechanical surging
    - ☐ Swabbing
    - ☐ Double flange swab
    - ☐ Air development
    - ☐ High velocity jetting
    - ☐ Chemical developments
        - ☐ The chemical development applied are polyphosphate
        - ☐ Two types of polyphosphates are used (crystalline and glassy)

18. What are the causes of well rehabilitation?
    - ☐ Incrustation due to groundwater chemical solution
    - ☐ Screen clogging
    - ☐ Befouling due to iron bacteria
    - ☐ Improper design of the well
    - ☐ Decrease of the discharge capacity of the well

Check List for Drilling Machinery Maintenance Technology

Date: _____

Region: _____
Organization: _____
Name of Respondent: _____
Job Position: _____
Education Level of Respondent: _____
Former EWTI/EWTEC Trainee: YES / NO

PART I : Engine

1. Starter motor cranks engine, but engine does not fire. What is the reason?
   - ☐ Engine stop solenoid defective
   - ☐ Failure of fuel system or Water mixed in the fuel
   - ☐ Air exists in fuel system
   - ☐ Injection fuel is little or the spray is not excellent
   - ☐ Malfunction of the fuel nozzle
   - ☐ Incorrect injection pressure
   - ☐ Deficiency in pressure of compression
   - ☐ Big gap in the piston ring due to wear and tear
   - ☐ Serious stickiness or breakage in piston ring
   - ☐ Incorrect in valve clearance
   - ☐ The valve stem is clipped in the guide pipe

2. Engine power is poor. What is the cause?
   - ☐ Malfunction of fuel system
   - ☐ Parts obstruction in fuel filter and fuel pipe
   - ☐ Inadequate fuel supplying
   - ☐ Incorrect fuel injection pump pressing
   - ☐ Air in the fuel system
   - ☐ Malfunction of the fuel nozzle
   - ☐ Carbon deposit in the nozzle hole
   - ☐ Needle was bit or Loose fit between needle and needle body
   - ☐ Engine speed (rpm) is low

PART II : THD Rotary Drilling Rig

3. What are the main components of THD drilling rotary rig which determines drilling capacity of the machine?
   - ☐ Pull up capacity of the rig by pull down cylinder
   - ☐ Drill head rotation torque & rpm
   - ☐ Mud pump working pressure & Discharge capacity
   - ☐ Air compressor working pressure & free air delivery capacity

4. What are the lubricants type used on THD rotary drilling rig components & Greasing parts?

   Lubricants
   - ☐ Diesel Engine oil
   - ☐ Hydraulic oil
   - ☐ Compressor oil
   - ☐ Hydraulic pump drive gear box oil
   - ☐ Hydraulic winch gear oil
   - ☐ Rotary gear box oil
   - ☐ Mud pump Gear box oil
   - ☐ Foam pump Gear box oil
   - ☐ Hammer oil

   Grease
   - ☐ All Winch cables
   - ☐ All sheaves
   - ☐ THD rotary Chains/ Cables
   - ☐ Top head rotary gear box
   - ☐ Water swivel
   - ☐ Mud pump Gland packing

5. Which parts of the rigs and air compressors required periodical maintenance spare parts?
   - ☐ Top Head Gear Box seals, Water Swivel Seals, Pull Down Cylinder seals, Leveling jack seals, Mast rising cylinder seal, Power tong seals, Pump Drive Gear Box seals
   - ☐ Mud & Foam pump suction & delivery Valves
   - ☐ Suction, Pressure & Return Line Hoses

- ☐ Air compressor air, oil & fuel filters, separator element & service kit, gear casing service kit, Minimum pressure valve service kit, Regulating valve service kit, Engine speed regulating valve service kit
- ☐ Diesel Engine air, oil & fuel filters
- ☐ Mud & Water Foam pump piston seals, oil stop seals & Gland packing seals

6. Which parts of the rigs and air compressors required schedule maintenance spare parts?
   - ☐ Top Head Gear Box Bearings, Gears & Shaft Key (Splines)
   - ☐ Pull down cylinder Wire rope/ Chains, sheaves and bearings
   - ☐ Hydraulic Suction Filters & return line filters
   - ☐ Hydraulic Pumps & Motors, Pump Drive Gear Box gears, Bearings & Key/Splines
   - ☐ Hydraulic Levers, gauges, pressure regulators (Relief valves), Counter Balance valves, check valves, pressure reducing valves, sequence valves
   - ☐ Hydraulic winches cables, , planetary gears, bearings & shaft key (splines)
   - ☐ Air compressor drive gears, bearings & couplings, Vacuum indicators, Check valve, oil stop valve, Throttle valve, Blow down valve, safety valve, thermostat, Load solenoid valve, start solenoid valve, scavenging lines, radiator, fan belt, regulating valve, min. pressure valve, air outlet valve, engine speed regulating valve, etc
   - ☐ Air Compressor Battery, Fault & Memory Module, relays, contactors, shut down switches, sensors, push button and fuses, lamps, gauges, hour meter, Fuel stop solenoid, load Solenoid & Starter solenoid, Alternator, Starter motor, alarm flasher light
   - ☐ Diesel engine fuel injection pump & feed pump, Diesel Engine overhaul service parts
   - ☐ Mud pump piston & rod, liners, suction & discharge valves, crank gears, bearings, connecting Rods, cross heads, gland packing's & seals, etc

7. If the chief driller reporting you that the rig has got a problem at site what is your preparation before you drive?
   - ☐ Gathering information from the chief driller about the cause of trouble

- ☐ Referring previously done maintenance services from history book of the rig
- ☐ Studying the problem from the above information's and referring rigs manual (trouble shooting part) and writing on the paper possible causes of trouble
- ☐ Preparing Hydraulic, pneumatic, Electrical Circuits and other relevant doc.
- ☐ Preparing required maintenance and testing tools
- ☐ Preparing necessary spare parts from the store

8. After arriving at the site, what are your steps of inspection to identify the problem?
   - ☐ Gathering information again from the crew about the cause of trouble
   - ☐ List out possible causes of the trouble from your experience and troubles shooting manuals
   - ☐ Start inspection from simple (visual inspection) to sophisticated points by using testing equipment's and tools
   - ☐ Identify the problem & Decide how to maintain parts at site or rebuilding components in your workshop or replacing parts
   - ☐ Test the rig for normal operation and stay for some hours while on operation
   - ☐ Write your work on rig history book for future reference

9. What could be the cause of trouble, if the THD rotary gear box does not move up (lack of power) while the control lever is on lifting position?
   - ☐ Diesel Engine rpm may be low
   - ☐ Hydraulic pump driving & gear box spline are worn out
   - ☐ Hydraulic oil in the tank is very low (Empty)
   - ☐ Suction filter of the pumps cloged
   - ☐ Air entering in Suction lines
   - ☐ Hydraulic pump leakage or worn out
   - ☐ Relief valve setting is low or valve worn out
   - ☐ Directional control valve leakage or worn out
   - ☐ Pressure lines leakage
   - ☐ Pull down cylinder seal worn out

10. What could be the cause of trouble, if the THD rotary gear box does not rotate

(lack of power) while the control lever is on clock wise position?

- ☐ Hydraulic motor leakage or worn out
- ☐ Relief valve setting is wrong or worn out
- ☐ Directional control valve leakage or worn out
- ☐ Pressure lines leakage

11. What could be the cause if the drill head moves down on the mast while the lever is at neutral?
    - ☐ Pull down cylinder Piston seal is worn out
    - ☐ Counter balance valve is worn out
    - ☐ Directional control valve spool is leaking or worn out
    - ☐ Return line is leaking

12. If the mud pump does not deliver fluid, what could be the cause of trouble?

    Hydraulic parts
    - ☐ Diesel Engine rpm may be low
    - ☐ Hydraulic pump driving & gear box spline are worn out
    - ☐ Hydraulic oil in the tank is very low (Empty)
    - ☐ Suction filter of the pumps may be cloged
    - ☐ Air in Suction lines
    - ☐ Hydraulic pump leakage or worn out
    - ☐ Directional control valve leakage or worn out
    - ☐ Pressure lines leakage
    - ☐ Hydraulic motor leakage or worn out
    - ☐ Relief valve settings low or worn out

    Mud pump parts
    - ☐ Suction hose stainer is cloged by mud cuttings
    - ☐ Air in suction line
    - ☐ Gland packing seal worn out
    - ☐ Mud pump piston seal worn out
    - ☐ Liner worn out
    - ☐ Delivery line leakage
    - ☐ Accumulator is empty

- ☐ Safety valve shear pin broken
- ☐ Hydraulic motor coupling to pinion gear shaft is worn out or broken

13. What could be the cause if the hydraulic winch does not hoist the rated load?
    - ☐ The winch base mounting bolt is loosen and binding of the gear train and this leads power loose
    - ☐ System relief valve may be set too low and relief valve needs adjustment or repair/ replace
    - ☐ Hydraulic oil may be hot and lead to internal leakage
    - ☐ Wire ropes may be wrapped irregular winding and sheaves not operating correctly
    - ☐ Winch hoisting capacity may be lower than the load

PART III : Air Compressor

What could be the cause of trouble?

14. Compressor oil is coming out through air filters
    - ☐ Defective check valve or oil stop valve

15. Compressor oil is coming out through air outlet valve
    - ☐ Defective oil separator

16. The flasher light of the compressor is lighting
    - ☐ Air filters are clogged

17. Compressor capacity or pressure is below normal
    - ☐ Chocked air filter elements
    - ☐ Regulating valve defective
    - ☐ Engine not up to max. load speed
    - ☐ Blow down valve leaking or on open position
    - ☐ Oil separator element clogged
    - ☐ Air intake throttle valve open partially
    - ☐ Safety valve leaking
    - ☐ Bleed of valve leaking

18. Compressor capacity or pressure is below normal

- ☐ Engine oil pressure too low
- ☐ Compressor or engine over heating
- ☐ Fuel tank contains insufficient fuel
- ☐ Low coolant level

Check List for Electro-Mechanical Maintenance Technology

Date: _____

Region: _____
Organization: _____
Name of Respondent: _____
Job Position: _____
Education Level of Respondent: _____
Former EWTI/EWTEC Trainee: YES / NO

PART I : Control Panel and Measuring Instruments

1. List motor starting methods
   - ☐ DOL Direct on lie starting
   - ☐ Auto transformer starting
   - ☐ Star delta Starting
   - ☐ Reactor motor starting
   - ☐ Soft starter starting

2. When do you use DOL starting method?
   - ☐ Below 5 KW motors/low power motors

3. Which one of starting method is preferable (based on smooth starting)?
   - ☐ Soft starting
   - ☐ Autotransformer starting

4. What is the use of Power factor correction capacitors in Control panel?
   - ☐ To decrease the reactive power hence decrease the amount of unwanted power and cost as well

5. How do you know whether the power factor correction unit is functional or not?
   - ☐ By observing the current reading or KVAR reading

6. What is the benefit of using transfer switch?
   - ☐ There is no possibility of danger using Generator and Transformer on the

same BUS bar

7. What is the use of the following devices in the control panel?

A. Pilot lights

- ☐ Gives us warning some fault arise in the corresponding circuit
- ☐ Show us the status of the circuit

B. Circuit Breakers

- ☐ It is a device designed to open and close a circuit by non-Automatic means, and to open a circuit Automatically on a predetermined over-current value without injury to itself when properly applied within its rating

C. Fuses

- ☐ A thin wire of short length having low melting point inserted in series with an electric circuit used as protective device

D. Pushbuttons

- ☐ A device that provides control of an equipment by pressing a button so that it makes or breaks an electric circuit

E. Contractors

- ☐ A contractor is a mechanical switching device like a push button but it is made to operate by electromagnetic force other than by hand pressure for making, breaking, carrying an electric circuit

F. Thermal Overload Relay

- ☐ A device that protects the circuit being damaged by an over current

G. Phase Sequence Relay

- ☐ The phase sequence indicator works by monitoring the phase sequence continually and preventing the motor from starting if the phase sequence has been reversed in the supply. This relay detects phase sequence, phase failure, and phase loss in three-phase mains

H. Floatless Level Control Relay

- ☐ A switching device used to open or close the circuit by receiving signal from water level sensor electrode

I. Float Switch

- ☐ A device used to detect the level of liquid within a tank

J. Water Level Sensor Electrode

- ☐ A device used to detect the level of liquid in the well

8. When do you suggest to pull out submersible pumps in case of fault happens?

- ☐ The insulation resistance ok but the motor couldn't rotate the pump. If the insulation resistance among the three phase cables and the earthing conductor fails.

9. How to test the motor winding?
   - ☐ Measure the insulation resistance among each phase using a megger and it should be infinity

10. How do you know whether a coil of a contractor is working or not?
    - ☐ By using a multimeter measure the voltage across a coil
    - ☐ By doing the power is off measure the resistance of a coil for open or short

11. What do you mean the rated current of a motor?
    - ☐ Normal reading when the motor is running means not at starting or at short circuit

12. How do you select fuse, circuit breaker and cable size?
    - ☐ Calculate the full load current - $I_L = P/(\sqrt{3}V_L\cos\theta)$
      - ☐ For fuse – calculate $I_n = 1.25\ I_L$ and then refer a table to the nearest upper value of I_n
      - ☐ For circuit breaker – calculate $I_n = 1.25\ I_L$ to $1.35\ I_L$ and then refer table to the nearest upper value of I_n
      - ☐ For cable size - refer a table to get the corresponding cable diameter for the nearest upper value of full load current rating

PART II : Pump

13. How do you install submersible pump?
    - ☐ Prepare materials for installation
    - ☐ Test the insulation resistance of the motor
    - ☐ Test the pump by rotating the shaft
    - ☐ Vulcanize the cable with the pump motor unit
    - ☐ Tight the level electrodes on their respective position (minimum sensor electrode should be kept 1meter above the strainer)
    - ☐ Lower the pump in to the casing using a crane
    - ☐ Tight the power and control cables across the riser pipe

- ☐ Lower the riser pipe piece by piece
- ☐ Put the last riser pipe on the supporting unit
- ☐ Connect the power and control cable to the junction box or control panel

14. Explain the probable cause for the following defects and suggest the solution

Problem	Possible Cause	Corrective Action
No discharge?	☐ Pump not primed	☐ Verify suction pipe is submerged. ☐ Increase suction pressure. ☐ Open suction valve
	☐ Wrong direction of rotation Reverse motor leads.	☐ Wrong direction of rotation Reverse motor leads.
	☐ Valves closed	☐ Open all suction and discharge valves.
	☐ Bypass valve open.	☐ Open Close bypass valve.
	☐ Air leak in suction line	☐ Tighten connections. ☐ Apply sealant to all threads. ☐ Verify suction pipe is submerged.
	☐ Clogged strainer	☐ Clean strainer
	☐ Clogged impeller	☐ Disassemble and remove blockage.
	☐ Impeller greatly worn or damaged	☐ Disassemble and replace impeller
Insufficient discharge?	☐ Suction pressure too low	☐ Increase suction pressure. ☐ Verify suction piping is not too long. ☐ Fully open any suction valves.
	☐ Bypass valve open	☐ Close bypass valve
	☐ Partly clogged strainer	☐ Clean strainer
	☐ Partly clogged impeller	☐ Disassemble and remove blockage
	☐ Speed too low	☐ Increase driver speed, if possible. ☐ Use larger size pump, if required
	☐ Impeller worn or damaged	☐ Disassemble and replace impeller.
Loss of suction after satisfactory operation?	☐ Pump not properly primed	☐ Reprime pump.
	☐ Air leaks in suction line	☐ Tighten connections. ☐ Apply sealant to all threads.

Problem	Possible Cause	Corrective Action
		☐ Verify suction pipe is submerged.
	☐ Air or vapor pockets in suction line	☐ Rearrange piping as necessary
	☐ Increase in fluid viscosity	☐ Heat fluid to reduce viscosity.
Excessive power consumption?	☐ Total head greater than specified	☐ Increase pipe diameter. ☐ Decrease pipe run
	☐ Total head lower than specified, pumping higher flow than expected	☐ Install throttle valve
	☐ Total head higher than rating with flow at rating	☐ Install impeller with correct diameter.
	☐ Rotating parts binding or severely worn	☐ Disassemble and replace worn parts.
Rapid pump wear?	☐ Abrasives in fluid	☐ Install suction strainer. ☐ Limit solids concentration. ☐ Reduce pump speed or use larger pump running at lower speed.
	☐ Corrosion wear	☐ Use materials of construction that are acceptable for fluid being pumped
	☐ Extended dry running	☐ Install power sensor to stop pump
	☐ Discharge pressure too high	☐ Increase pipe diameter. ☐ Decrease pipe run.
Excessive noise and vibration?	☐ Partly clogged impeller causing imbalance	☐ Disassemble and remove blockage
	☐ Damaged impeller and/or shaft	☐ Disassemble and replace damaged parts.
	☐ Suction and/or discharge piping not anchored or properly supported	☐ Anchor per Hydraulic Institute Standards.
	☐ Base not rigid enough	☐ Tighten hold-down bolts on pump and motor or adjust stilts. ☐ Inspect grout and regrout if necessary
	☐ Worn motor bearings	☐ Replace bearings or motor
	☐ Pump cavitation	☐ Increase NPSH available

Problem	Possible Cause	Corrective Action
Excessive product leakage?	☐ Static seal failure caused by chemical incompatibility or thermal breakdown	☐ Use O-rings or gaskets made of material compatible with fluid and temperature of the application
	☐ Static seal failure caused by improper installation	☐ Install O-rings or gaskets without twisting or bending. ☐ Use star-pattern torque sequence on housing bolts during assembly. ☐ Allow Teflon O-rings to cold flow and seat during tightening. ☐ Torque bolts to specification.
	☐ Mechanical seal worn or damaged	☐ Disassemble and replace mechanical seal. ☐ Prime pump and avoid dry running.
	☐ Pump port connections not properly sealed	☐ Use Teflon tape or other suitable sealant. ☐ Use gaskets compatible with fluid and temperature of the application.
	☐ Crevice corrosion of pump housing material	☐ Only pump chemical fluids that are compatible with the pump housing material. ☐ Decrease temperature to reduce corrosion rate to acceptable value. ☐ Flush idle pumps that are used to pump corrosive chemicals, such as acids and caustics. ☐ Eliminate contaminants in the fluid that can accelerate corrosion wear.

PART III : Engine

15. Causes and Troubleshooting for the Engine Not Being Started

Causes	Troubleshooting
☐ It is cold - Machine oil is viscous	☐ Fill machine oil into crankcase after warming-up. ☐ Fill machine oil into inlet pipe ☐ Remove the connection belt from the machine ☐ Start the engine and stop it when it is heating, assemble the belt and then restart the engine
☐ Failure of fuel system – unwanted fluid mixed in the fuel, worn-out parts	☐ Clean fuel tank, fuel filter and fuel pipe, and then change the spare parts and fuel

Causes	Troubleshooting
☐ The fuel get thickening and can't flow easily	☐ Use prescribed brand fuel
☐ Air exists in fuel system	☐ Emit the air, tighten each connect part to the fuel pipe
☐ Injection fuel is little or the spray is not excellent	☐ Check the position of governing handle or check and clean the fuel nozzle, change the nozzle if necessary
☐ Incomplete combustion	☐ Mainly by ill spray ☐ Incorrect delivery angle ☐ Leakage in gasket of cylinder head ☐ Deficiency in pressure of compression
☐ Interrupted of diesel fuel	☐ Lack of oil, should fill fuel into the fuel tank. If have obstruction or leakage in the fuel pipe and fuel filter, drain out them with the air.
☐ Deficiency in pressure of compression; ☐ Loosen in the nut of cylinder head; ☐ Damage or leakage in the gasket of cylinder	☐ Tighten the nut of cylinder head in the diagonal sequence; check the gasket of cylinder as per the standard requirement. When the engine with the new gasket is heating, tighten the nut of cylinder head again
☐ Big gap in the piston ring due to wear and tear	☐ Change the piston ring
☐ Leakage caused by each gap of piston ring lined in one direction	☐ Make each gap of piston at angle of 120
☐ Serious stickiness or breakage in piston ring	☐ Clean it by diesel fuel or change the piston ring.
☐ Leakage in gas valves	☐ Skive the gas valve, or send it to repair factory if the vestige is too deep.
☐ Incorrect in valve clearance	☐ Adjust the gap as specified.
☐ The valve stem is clipped in the guide pipe	☐ Disassemble the gas valve, clean the stem and guide pipe with diesel fuel

16. Causes and Troubleshooting for Deficient Power of Diesel Engine

Causes	Troubleshooting
☐ Malfunction of fuel system;	☐ Check the fuel switch, they should be opened

Causes	Troubleshooting
☐ Parts obstruction in fuel filter and fuel pipe; ☐ Inadequate fuel supplying;	fully. ☐ Clean the fuel filter and fuel pipe.
☐ Bad pressing of fuel pump	☐ Check or change the damaged parts of fuel pump.
☐ Malfunction of the fuel nozzle; ☐ Incorrect injection pressure	☐ Adjust the injection pressure
☐ Carbon deposit in the nozzle hole	☐ Clean
☐ Needle was bit	☐ Clean or change
☐ Loose fit between needle and needle body	☐ Change
☐ Obstruction in air filter	☐ Remove, clean or change the filter core.
☐ Not fast enough of engine speed	☐ Check the speed of engine with the tachometer, and then readjust the speed limit bolt.

17. Causes and Troubleshooting for Engine Stopping Automatically

Causes	Troubleshooting
☐ Malfunction of the fuel system ☐ Run out of fuel	☐ Fill fuel.
☐ Obstruction in fuel pip or air filter	☐ Check or clean.
☐ Air exists in fuel system	☐ Emit the air.
☐ Nozzle needle was bitted	☐ Clean, skive the nozzle or change it if necessary
☐ Obstruction in air filter	☐ Check, clean or brush off, or change the filter element
☐ Sudden increase of load	☐ Lighten the load.

18. Causes and Troubleshooting for Exhaust with Black Smoke

Causes	Troubleshooting
☐ Overload	☐ Lighten the load; change the matched machine if it does not comply with the requirements
☐ Bad spray	☐ Check injection pressure and spray condition and remedy; ☐ Change the nozzle if it was damaged.
☐ Lack of air or leakage	☐ Clean the air filter; check the cause of leakage and remedy.

19. Causes and Troubleshooting for Exhaust with Blue Smoke

Causes	Troubleshooting
☐ Machine oil mixed in cylinder	☐ Check the oil level, drain off the redundant engine oil
☐ Piston ring is clipped, worn or lack of elasticity, hatch of each ring turned to the same direction and make engine oil up	☐ Check and replace the piston ring, and cross hatch of each ring
☐ Big gap between piston and cylinder	☐ Remedy or change
☐ Wear and tear of valve and guide	☐ Change

20. Causes and Troubleshooting for Exhaust with White Smoke

Causes	Troubleshooting
☐ Water mixed in diesel fuel	☐ Clean the fuel tank and filter and change the diesel fuel.

PART IV : Generator

21. What are the possible causes of an electrical generator not giving the output voltage?

Symptom	Possible Cause	Test and Remedies
No Output Voltage	☐ Faulty generator stator or rotor	☐ Disconnect the leads from AVR terminals .Check voltage across leads with a Multimeter, with the set running at correct speed
	☐ Insulation failure to earth, (ground), on permanent magnet stator	☐ Disconnect leads and, 'Megger' test to earth
	☐ Loose, broken or corroded connections	☐ Check connections, repair and replace where necessary
	☐ Very low insulation resistance to earth (ground),on exciter stator or main stator	☐ Check the insulation resistance value with a Megger.(Disconnect AVR during this test, and remove any Neutral earth connection).
	☐ Main rectifier diode(s) short circuit	☐ Carry out Test diodes. Replace where necessary. Check diodes

Symptom	Possible Cause	Test and Remedies
	☐ Winding fault. Open circuit or short circuit on any winding in the machine	☐ Check winding resistance values.
	☐ Fault in AVR.	☐ Replace the AVR and re-test machine

22. What are the possible causes of an electrical generator giving under voltage and overvoltage?

Symptom	Possible Cause	Test and Remedies
High Output Voltage	☐ Sensing supply from Main Stator to AVR open circuit or too low.	☐ Check sensing supply voltage
	☐ AVR 'VOLTS' control or hand trimmer incorrectly set.	☐ Adjust as necessary. Ensure that the engine speed is correct first
	☐ AVR faulty.	☐ Replace AVR and re-test.
	☐ Loose, broken or corroded connections	☐ Check connections on auxiliary terminal board and AVR terminals. Repair or replace if necessary
	☐ Unbalanced load.	☐ Check voltages on all phases. If unbalanced, re-distribute loading over three phases.
	☐ Leading Power Factor load (capacitor banks).	☐ Check excitation volts across X A leading power factor will give an abnormally LOW DC excitation. ☐ Remove power factor correction equipment at low loads
Low Output Voltage	☐ Engine speed low. Under frequency protection (UFRO) circuit activated	☐ Check AVR LED. If lit, UFRO is activated, indicating low speed. ☐ Check speed with tachometer. Adjust governor control to nominal speed, or up to maximum (+4%) of nominal speed

Symptom	Possible Cause	Test and Remedies
	☐ Voltmeter faulty or sticking.	☐ Check and verify voltage across machine output terminals, with a Millimeter
	☐ Loose broken or corroded connections	☐ Check the wiring for poor connections. Repair or replace where necessary.
	☐ Fault on power supply from main stator.	☐ Test voltage, at no load.
	☐ Engine speed droop greater than 4%.	☐ Check if AVR LED is lit, UFRO is activated, (low speed indication). Check engine speed no load and full load. ☐ Engine governing should be within + 4% and –1% of nominal speed. ☐ Reset as necessary.
	☐ Under frequency protection circuit moperational (UFRO).	☐ Check AVR LED. If lit, UFRO is activated, increase engine speed to correct levels.
	☐ Faulty permanent magnet generator (PMG) stator or rotor	☐ Disconnect the PMG leads from AVR terminals P2, P3, P4. ☐ Check voltage across leads with a Multimeter, with the set running at correct speed. For 50Hz, Voltage across P2, P3 and P4 should be approx. 170VAC.
	☐ AVR faulty.	☐ Replace AVR and re-test.
	☐ Fault on winding or rotating diodes	☐ Any fault in this area will appear as high excitation voltage across X+ (F1) and XX- (F2).
	☐ Voltage drop between Generator and load, due to I^2R losses in the cable. This will be worse during current surges (motor starting etc)	☐ Check the voltage at both ends of the cable run at full load. Differences in voltage indicate a volts drop along the cable. In severe cases, a larger diameter cable is required.

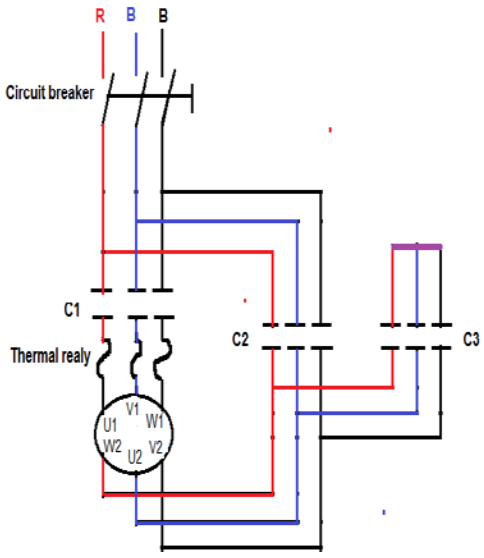
PART V : PLC

23. What are the major components of a PLC circuit?
    - ☐ Input and output
    - ☐ Power supply
    - ☐ Programming device
    - ☐ Memory
    - ☐ Processor

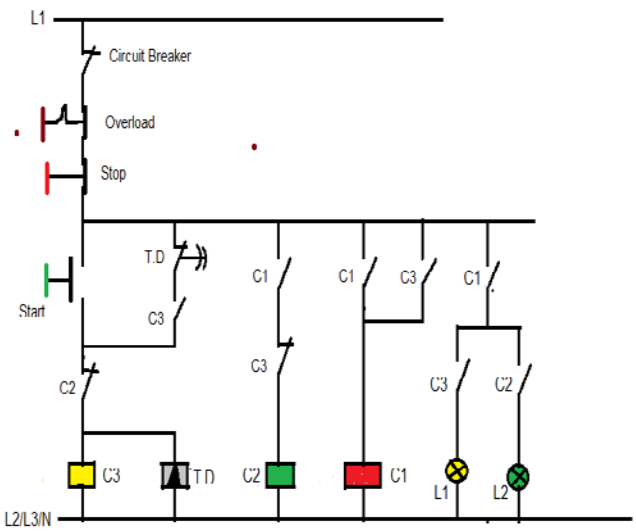
PART VI : Circuit Diagram Reading

24. How do you read the following control and power circuits

☐ Circuit A



☐ Circuit B



ANNEX 3

Format for Group discussion

Technical Gap Survey

Guiding Notes for Focus Group Discussion

Targets:

a) Institutions: RWB, WWO, ZWO, TWS, WWDE, WWCE, WWCDSE and Private Co.

b) Technicians/Engineers: Make group discussion with interviewed technical staff of EMMT group, Drillers and Drilling Supervisors of DT group, Hydro-geologists of GWI group and Technicians or Mechanical Engineers of DMMT group separately.

Purpose: to get a range of issues either missed or poorly obtained during the completion of the questionnaire and to confirm information obtained through questionnaire and interview as well as to get information if there are problems other than skill gap that contribute to low performance.

Method:

1) Based on the completed questionnaire the interviewers should prepare a few semi-structured questions (of critical points) that lead the group discussion.

2) The interviewer should open the discussion by appreciating the participants for completion of the questionnaire and responses given for check-list questions AND lead the discussion by encouraging each participant for his/her comment has high value on the gap survey.

Common issues to be discussed:

1. Based on the results of the questionnaire, discuss important points (such as their daily activities, proficiency and skill gaps etc.);
2. Points which are not fully explained or not covered by the questionnaire at all to identify the skill gap; and
3. Discuss whether there are other issues that can affect performance other than lack of skills such as:
   - lack of proper tools or materials,
   - lack of time and
   - lack of authority to do assigned tasks etc.

Focus Group Discussion

Organization: _____

Date: _____

Place for discussion: _____

Facilitator(s): _____

Participants name:

Name	Position	Profession

Issues to be discussed (Filled by interviewer)

1. Based on the results of the questionnaire, discuss important points (their daily activities, proficiency and skill gaps etc.).

2. Points which are not fully explained or not covered at all.

3. Discuss whether there are other issues that can affect performance other than lack of skills such as:
   - lack of proper tools or materials,
   - lack of time and
   - lack of authority to do assigned tasks etc.

*Use the back side of this paper if you need more space for the comments

ANNEX 4

Format for interview to Manager/Supervisor

Technical Gap Survey

Interview Guiding Questions for Interviewing Supervisor or Manager of Target Institution

(The interviewer before making this interview he/she has first to make brief analysis and have summary points of the questionnaire completed and responses given to check list questions by the technicians/engineers)

Date of Interview …….

Name of Target Institution……

Name of Supervisor/Manager (of technician /engineer who completed the questionnaire)
……

A- Competency of Technician/Engineer

1. What are the major duties and responsibilities of the particular technician/engineer who completed the questionnaire? (Please ask the list and official copy of job description of all technical staff of the institution)
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2. The summary of the completed questionnaire (and responses given to open-end questions/check list) by your technician/engineer indicated that he/she has sufficient knowledge and at least some experience to perform the following tasks:
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……

2.1 Do you agree by the above-mentioned responses given by your technician/engineer?

Yes ☐ No ☐

2.2 Please give us some confirming information for your response of "Yes" or "No"
……
……
……
……

3. Your technician/engineer responded that he/she has basic theoretical knowledge but little or no experience to perform the following tasks?
……
……
……
……
……
……

3.1 Do you agree by the above-mentioned responses given by your technician/engineer?

Yes ☐ No ☐

3.2 If "yes", what is/are the reason/s for not having adequate practice or experience to perform these tasks by your technician/engineer (for instance, attitude, skill or lack of tools or any other problem)?

……
……
……
……

4. Do you have any comment or suggestions to improve the competency level of your technician/engineer?

……
……
……
……

B- Willingness & Cooperation of the Institution to Participate in Pilot Training and Monitoring & Evaluation Program

1. Is your institution willing to participate in the pilot training program of our project by sending trainees at least twice over the coming three years?

Yes ☐ No ☐

2. If your answer is "Yes" to the above-mentioned question, is your institution willing for post-training monitoring and evaluation that will be carried out by the project?

Yes ☐ No ☐

3. Interviewer evaluation on level of cooperation of this particular institution during this technical gap survey.

High ☐ Medium ☐ Low ☐

ANNEX 5

List of survey team members

Members of survey team

Technical subject	Group	Name of member	Title/Profession
GI/DT/DMMT	Group A	Ato Tamiru Fekadu	Dept. leader of WRD&DT / Senior hydrogeologist
		Ato Mengesha Sisay	Senior Geophysist
		Ato Samuel Zewdu	Senior GIS and Remote Sensing Expert
		Ato Melaku Behailu	Senior Mechanical Engineer
		Ato Mulugeta Kinfu	Local expert/ Senior hydrogeologist
	Group B	Ato Bizuneh Demissie	Senior Drilling Technologist
		Ato Zemenu Addis	Senior Hydrologist
		Ato Dereje Fekade	Senior Geologist
		Ato Alemayehu Bersisa	Senior Mechanical Engineer
		Ato Endris Mohammed	Local expert/ Mechanical engineer
EMMT	Group A	W/ro Alemwork Gudu	Senior Electrical Engineer
		Ato Gutema Terfassa	Junior Electrical Engineer
		Ato Nigussie Alemu	Senior Drainage Engineer
		Ato Habtamu Tesfaye	Construction Management
		Ato Beneberu Demissie,	Local expert/ Senior electrical engineer
	Group B	Ato Endalemahu Endale	A/Dept. leader of EM&DMMT/ Senior Electromechanical Engineer
		Ato Lolo Adgo	Senior Construction Management
		Ato Atikilt Abrha	Training Officer

JICA Experts

Name	Title
Akino Kitazume	Chief Advisor/Training Management 1
Masahiko Ikemoto	Deputy Chief Advisor / Training Management 2
Makoto Tokuda	Groundwater Development 2
Hidekuni Usami	Drilling Technology
Tamotsu Ishii	Drilling Machinery Maintenance Technology
Koji Abe	Electro-mechanical Machinery Maintenance Technology

ANNEX 6

Photos

Briefing of the questionnaire to the respondents
(Oromia Drilling Enterprise)

Discussion with manager for the introduction of the work (Benishangul WWCE)

Direct interview to EMMT respondents
(Benishangul Town Water Supply Office)

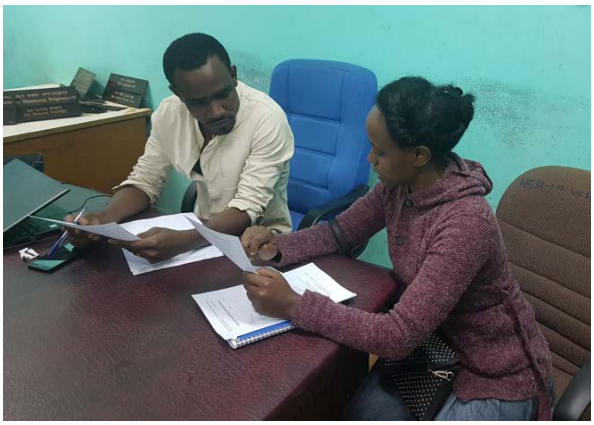
Direct interview to the DT respondents
(Benishangul WWCE)

Group discussion with all respondents
(Oromia Drilling Enterprise)

Questionnaire filling by DT respondents
(Oromia Drilling Enterprise)

Photo-1

Questionnaire filling by GI respondents
(Benishangul Regional Water Bureau)



Direct interview to EMMT respondents
(Benishangul Regional Water Bureau)

Questionnaire filling by DT respondents
(Benishangul WWCE)

Questionnaire explanation to DMMT
respondents (Amhara WWDE)

Analysis and report preparation by EWTI staff
at Dukam TVETC

Final presentation of findings for EWTI staff
including management representatives and
invited external experts by each survey group at
a hotel in Bishoftu

Photo-2