

Annexes

Project 1- City-
Wide resource re-
use and waste
minimisation
project

Annex 1 - demand projections

Demand projections

Table 1: Waste generation projections for Mek'ele 2017 - 2025

Description	Unit (000s)	Year								
		2017	2018	2019	2020	2021	2022	2023	2024	2025
Population	000s	366.2	381.4	397.1	413.5	430.6	448.4	466.9	486.2	506.3
Municipal	Kg	26,736.2	27,840.4	28,990.2	30,187.5	31,434.3	32,732.5	34,084.3	35,492.0	36,957.8
	m3	133.7	139.2	145.0	150.9	157.2	163.7	170.4	177.5	184.8
Industrial (IPs)		53,746.3	53,746.3	53,746.3	53,746.3	53,746.3	53,746.3	53,746.3	53,746.3	53,746.3
	Kg	268.7	268.7	268.7	268.7	268.7	268.7	268.7	268.7	268.7
	m3	402.4	407.9	413.7	419.7	425.9	432.4	439.2	446.2	453.5
Total	m3	536.1	547.1	558.6	570.6	583.1	596.1	609.6	623.7	638.3
cost/m³ (Birr)		8,663.3	8,841.7	9,027.5	9,221.0	9,422.5	9,632.3	9,850.7	10,078.2	10,315.1
Cumulative cost (Birr)		8,663.3	17,505.0	26,532.5	35,753.5	45,176.0	54,808.2	64,659.0	74,737.2	85,052.2

Assumptions

Industrial waste

Hectare (K.g.)	125
Number of days	365
Total hectares three IPs (MIP, Velocity, DBL in all phases)	1178

Municipal Waste

Number of days	365
MSW/person (K.g.)	0.2

Conversion factor kg/m3	200
Cost of disposal (birr/m3)	16.16

Annex 2 – Detailed project components

Component 1: Technical Assistance

As a first step, an assessment of the existing waste streams volume, composition and SWM systems in the cities and industrial parks located along the KMIC corridor is needed to gain a better understanding of current needs and gaps, and wider impacts of improper SWM practices (on public health, climate vulnerability and environmental pollution). The lack of reliable and recent solid waste data constitutes a major challenge for developing effective and innovative SWM strategies along the corridor. This project will be used to address this critical gap in knowledge. It will aim to provide technical advisory services to public entities to improve the knowledge of the waste situation and challenge and ensure that the best available information, international guidelines and practices are incorporated in the formulation and implementation of waste policies and projects at the city and corridor level. The technical assistance sub-component will support the following interventions:

Table 2: Provision of technical advisory services

Stakeholder	Technical assistance project
MUDH	<ul style="list-style-type: none"> Review existing legal, regulatory and policy framework, and identify regulatory and policy reforms necessary to support the implementation of the project. Developing standards and criteria for Material Recovery Facilities (MRF), Waste-to-Energy (WtE) plant and other alternative waste treatment technology Tariff setting guidelines
Corridor level	<ul style="list-style-type: none"> Baseline assessments of major cities along the Kombolcha – Mek’ele corridor to establish current waste stream volumes, characteristics and existing SWM practices and service levels. Market study for recyclable and compost
City Administrations	<ul style="list-style-type: none"> Formulation and implementation of local ISWM strategies that identify priority intervention areas at the city level, clarify the roles in SWM and provides adequate coordination mechanisms; Feasibility and engineering designs studies for proposed SWM facilities Preparation of rules and regulations for solid waste separation Development of local tariff studies
Industrial Parks	<ul style="list-style-type: none"> Preparation of waste treatment plans for industrial parks/zones Advice on technology options to maximise materials efficiency; including the re-use of municipal and other waste for inputs to industrial processing

Component 2: Capacity Building

This component will aim at building the capacity of stakeholders involved in integrated solid waste management practices both at national, regional and local level. The main areas and stakeholders to strengthen are described in Table 3.

Table 3: Type of capacity building activity proposed by stakeholder

Type of training/ Target stakeholder	MUDH	Regional Governments	ULG	EPA (federal, regional and local)	Regional IPDC	Manufacturers	MSEs
Capacity building programme for executive entities to plan, design, implement and operate ISWM strategies (including improved landfill management)		•	•				
Training of design review and construction supervision for alternative waste treatment technologies	•	•	•	•			
Training on strategies to improve efficiency in collection and potential of waste to resource recovery option			•				•
Workshops and training in industrial waste minimization strategies and benefits			•	•	•	•	

Annex 3 – Cost comparison of technical options

Table 4: Costs and references

TECHNOLOGICAL SOLUTION	COST ESTIMATE (USD/TONNE)	COUNTRY	WEBLINK	REFERENCE
Composting (Windrow)	22	US	http://www.seas.columbia.edu/earth/wtert/sofos/haaren_thesis.pdf	Rob van H. (2009). Large scale aerobic composting of source separated organic wastes: A comparative study of environmental impacts, costs and contextual effects.
Composting (In-vessel)	147	US	http://www.seas.columbia.edu/earth/wtert/sofos/haaren_thesis.pdf	Rob van H. (2009). Large scale aerobic composting of source separated organic wastes: A comparative study of environmental impacts, costs and contextual effects.
Composting (Windrow)	54	US	http://www.cityofpaloalto.org/civicax/filebank/documents/15113	City of Palo Alto Public Works Department (2008). The City of Palo Alto Compost Facility Feasibility Report
Composting (In-vessel)	81	US	http://www.cityofpaloalto.org/civicax/filebank/documents/15113	City of Palo Alto Public Works Department (2008). The City of Palo Alto Compost Facility Feasibility Report
Composting (Windrow)	32	Canada	http://compostingcouncil.org/wp/wp-content/uploads/2011/03/Measuring-the-benefits-of-composting-source1.pdf	CM Consulting (2007). Measuring the benefits of composting source separated organics in the Region of Niagara.
Composting (Windrow)	30	UK	http://www.ciwem.org/wp-content/uploads/2016/04/Composting.pdf	CIWEM (2016). Policy Position Statement: Composting.
Composting (In-vessel)	57	UK	http://www.ciwem.org/wp-content/uploads/2016/04/Composting.pdf	CIWEM (2016). Policy Position Statement: Composting.
Composting (Windrow)	4.6	South Africa	https://books.google.com.ng/books?id=7Hj80Tr4ymUC&pg=PA117&lpg=PA117&dq=cost+estimate+for+composting+in+africa&source=bl&ots=ETLXtE6vzl&sig=izh8kPzvF8Ahze3cT w8gApKUGCQ&hl=en&sa=X&ved=0a hUKEwiS7OafvtzUAhVTsBQKHS6gArsQ6AEIYiAH#v=onepage&q=cost%20estimate%20for%20composting%20in%20africa&f=false	Harald W. (2009). Taking Action on Climate Change: Long Term Mitigation Scenarios for South Africa
Door to Door Collection (Weekly)	141	Denmark	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Ennomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Door to Door Collection (Weekly)	47	UK	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Ennomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Door to Door Collection (Weekly)	111	Netherlands	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Ennomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU

Door to Door Collection (Bi-Weekly)	75	Germany	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Eunomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Door to Door Collection (Weekly)	158	US	http://reason.org/files/796f26b0feb91f30abb82be965577873.pdf	Lynn S. (1995). SOLID WASTE RECYCLING COSTS.
Door to Door Collection (Mixed Collection)	114	US	http://www.seas.columbia.edu/earth/wtert/sofos/dubowitz_thesis.pdf	Rob van H. (2009). Large scale aerobic composting of source separated organic wastes: A comparative study of environmental impacts, costs and contextual effects.
Door to Door Collection (Food Waste Collection)	280	US	http://digitalcommons.morris.umn.edu/cgi/viewcontent.cgi?article=1000&context=horizons	Alicia B. (2014). Cost-Benefit Analysis of Food-Waste Composting Program at UMM.
Door to Door Collection (Five times a week)	67	France	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Eunomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Door to Door Collection (Weekly)	82.8	Finland	https://www.researchgate.net/publication/227856156_Pneumatic_vs_door-to-door_waste_collection_systems_in_existing_urban_areas_A_comparison_of_economic_performance	Nea T., Katja M., Eveliina K., Markku O., Henna P. and Elina M. (2012). Pneumatic vs. door-to-door waste collection systems in existing urban areas: a comparison of economic performance.
Door to Door Collection (Bi-Weekly)	84	Belgium	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Eunomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Material Recovery Facility (Mechanized/Manual)	50-101	UK	http://www.wrap.org.uk/sites/files/wrap/RecoveringValueMRFs.3644.pdf	WRAP (N/A). Recovering value from MRFs: A review of key studies relating to the specification, operation and costs of Materials Recovery Facilities
Material Recovery Facility (Mechanized/Manual)	33-67	UK	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Eunomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Material Recovery Facility (Mechanized/Manual)	142	Ireland	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Eunomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Material Recovery Facility (Mechanized/Manual)	204-256	France	http://ec.europa.eu/environment/waste/studies/pdf/eucostwaste.pdf	Eunomia Research & Consulting (2002). Costs for Municipal Waste Management in the EU
Material Recovery Facility (Mechanized/Manual)	90-182	US	http://reason.org/files/796f26b0feb91f30abb82be965577873.pdf	Lynn S. (1995). SOLID WASTE RECYCLING COSTS.
Material Recovery Facility (Mechanized/Manual)	55	US	https://www.dep.state.fl.us/waste/quick_topics/publications/shw/recycling/InnovativeGrants/IGYear9/finalreport/Pinellas_IG8-06_MRF_Feasibility_Study.pdf	Kessler Consulting, Inc. (2009). MATERIALS RECOVERY FACILITY FEASIBILITY STUDY.
Material Recovery Facility (Mechanized/Manual)	127	US	http://www.seas.columbia.edu/earth/wtert/sofos/dubowitz_thesis.pdf	Rob van H. (2009). Large scale aerobic composting of source separated organic wastes: A comparative study of environmental impacts, costs and contextual effects.
Material Recovery Facility (Mechanized/Manual)	50.3	US	http://infohouse.p2ric.org/ref/31/30777.pdf	National Solid Wastes Management Association (1992). The Cost To Recycle At a Materials Recovery Facility.

Annex 4 - Benefit modelling

Table 5 -Me'ele

NUDSP population forecast							
City / Year	2007	2013	2015	2020	2025	2030	2035
	215,914	298,620	337,773	455,057	602,581	775,199	962,972
Forecasted solid waste by composition							
Synod.	Description	Unit of measurement	Year				
			2015	2020	2025	2030	2035
1	Population		337,773	455,057	602,581	775,199	962,972
2	Total Solid waste generated	Meter cube	490,648	567,704	664,627	778,037	901,404
2.1	Industrial (IPs)	Kilogram	53,746,250	53,746,250	53,746,250	53,746,250	53,746,250
		Meter cube	268,731	268,731	268,731	268,731	268,731
2.2	Municipal	Kilogram	44,383,388	59,794,529	79,179,109	101,861,098	126,534,582
		Meter cube	221,917	298,973	395,896	509,305	632,673
			98,130	113,541	132,925	155,607	180,281
	Jobs		2,027	2,730	3,615	4,651	5,778
	Wages		\$1,823,975	\$2,457,309	\$3,253,936	\$4,186,073	\$5,200,051
			\$1,824	\$2,457	\$3,254	\$4,186	\$5,200

Assumptions

Industrial waste @ 125 kg/hectare/day (source MIP feasibility study, 2016)		Municipal waste	
Hectare (k.g.)	125	Waste generation	0.36kg /capita/day
Number of days	365	Jobs	6 per 1000 pop.
Total hectares three IPs (MIP, Velocity, DBL in all phases)	1178	Wage	US\$75/month

Table 6: Kombolcha

NUDSP population forecast							
City /Year	2007	2013	2015	2020	2025	2030	2035
	58,667	81,477	93,382	130,972	182,189	249,342	334,274
Forecasted solid waste by composition							
S.No.	Description	Unit of measurement	Year				
			2015	2020	2025	2030	2035
1	Population		93,382	130,972	182,189	249,342	334,274
2	Solid waste						
2.1	Municipal	Kilogram	9,884,466	13,863,347	19,284,747	26,392,882	35,382,884
		Meter cube	49,422	69,317	96,424	131,964	176,914
2.2	Industrial (IPs)	Kilogram	31,937,500	31,937,500	31,937,500	31,937,500	31,937,500
		Meter cube	159,688	159,688	159,688	159,688	159,688
3	Total	Meter cube	209,110	229,004	256,111	291,652	336,602
	Total	KGs	41,821,966	45,800,847	51,222,247	58,330,382	67,320,384
	Total	tonnes	41,822	45,801	51,222	58,330	67,320
	Jobs	numbers	560	786	1,093	1,496	2,006
		wages	504,262	707,247	983,823	1,346,448	1,805,079
			\$504	\$707	\$984	\$1,346	\$1,805

Assumptions

Industrial waste @ 125 kg/hectare/day (Source KIP feasibility study, 2015)

Hectare (K.g.)	125
Number of days	365
Total hectares KIP	700

Municipal Waste @ 0.44 kg/person/day in 2030 (Source: Ethiopia CRGE Strategy, 2011)

Number of days	365
MSW/person (K.g.)	0.29
Conversion factor:	200 kg/m ³
Jobs	6
Wage	75

Annex 5 Legislative framework

Table 7: Applicable laws and regulations in the solid waste sector

Policies and regulations	Description (objectives, main instruments, provision, key issues and gaps)
Environmental Policy of Ethiopia (EPE, 1997)	The EPE is the overarching policy for environment-related activities in the country. EPE's overall goal is to improve and enhance the health and quality of life of all Ethiopians and the promotion of sustainable social and economic development. It seeks to do so through the sound management and use of resources. The EPE defines policies for 10 sectors including soil and agriculture, forest and woodland, biodiversity, water, energy, minerals, human settlement, industrial waste and climate change and cultural heritage. It also covers ten cross-sectoral issues that need to be considered for effective implementation. With regards to SWM, the policy emphasises: i) the need to give priority to waste collection services and its disposal; ii) to undertake studies which identify suitable sanitary landfill sites in the major cities and towns of Ethiopia; and iii) to establish safe limits for the location of sanitation landfill sites in the vicinity of bore holes and dams, and issue regulations to enforce them.
Environmental Pollution Control Proclamation (No. 300/2002)	The proclamation contains provisions for the control of pollution, management of municipal waste, and management of hazardous waste, chemical and radioactive substances. The proclamation states that 'no person shall pollute the environment' but also includes provisions for prevention and penalties if pollution does occur. It follows the 'polluter pays principle' and requires the person who causes pollution to pay for any clean up. The proclamation mandates all urban governments to devise and implement safe and effective mechanisms to handle, transport and store municipal waste. It also states that transporting or treatment of municipal waste can only be done with a permit from the EPA. The EPA, in collaboration with regional environmental agencies, is required to monitor and evaluate the adequacy of MSWM systems and ensure their effective implementation.
Solid Waste Management Proclamation (No. 513/2007)	Adopted as federal law, the solid waste proclamation aims to prevent environmental damage from solid waste while harnessing its potential economic benefits. The proclamation regulates how environmental protection agencies, regional states, urban administrations and legal persons should act or interact concerning solid waste. It empowers urban administrations to lead their waste management functions according to pre-designed plans and requires them to establish a solid waste treatment facility. Article 14 of this proclamation requires all solid waste disposal sites to conform to relevant environmental and local regulations as well as to secure EIA according to the relevant law. Further, the proclamation indicates the need for involvement of the private sector for effective management and describes the safe transport of solid waste including hazardous waste.
Environmental Protection Organs Establishment Proclamation (No. 295/2002)	The Proclamation re-establishes and re-defines the functions of an Environmental Protection Authority. The Proclamation stipulates the mandatory need for the establishment of environmental organs by region. They are mandated to enable regions to coordinate the formulation, implementation, review and revision of regional conservation strategies; environmental monitoring, protection and regulation; ensure the implementation of federal environmental standards, or prepare their own standards; and prepare reports on the state of the environment and sustainable development in their respective regions.
Environmental Impact Assessment Proclamation (No. 299/2002)	This proclamation makes the preparation of an Environmental Impact Assessment (EIA) mandatory for specified categories of activities undertaken either by the public or private sectors. The proclamation outlines the duties of the developer and specifies the scope and content of EIAs. It requires that all projects get environmental clearance or authorization from the EPA or Regional Environmental Agency (REA). Federal EPA are also empowered to prepare procedures, regulations, guidelines and standards to effectively implement and enforce the EIA proclamation.

Environmental Impact Assessment Guideline Document, May 2002	<p>The Guideline was prepared to facilitate the implementation of the EIA Proclamation. It aims to ensure that the government and all interested and affected parties have the opportunity to engage effectively in the EIA process.</p> <p>The document details the required procedures for conducting an EIA. Reference is made to the legislation and policies with which projects must comply in specific development sectors. With regards to SWM, the Guideline requires the preparation of full EIA study for investment and establishment of the following facilities: incineration facility, composting plant, recovery/re-cycling plant, municipal Solid Waste landfill facility, waste depots, and collection and transportation of the wastes.</p>
Solid Waste Management Manual (2012)	<p>The Manual was prepared with the aim of improving the technical capacities of all parties who are engaged in the process of solid waste management in Ethiopia (i.e. municipalities, private sectors, civil societies). It is used as a reference material to ensure that SWM is carried out in an effective, integrated and sustainable way.</p> <p>The Manual recommends to develop an Integrated Solid Waste Management (ISWM) Plan. Additionally, it makes recommendations for various SWM components and facilities for 5 categories of cities. For instance, transfer stations and sanitary landfills are required for cities with over 50,000 inhabitants. The Manual also identifies technical and legal criteria for the selection of sanitary landfill sites. For instance, it states that landfills should be built for a minimum period of 8 years and should not be located less than 200 meters from major water bodies, within 0.5 km of a protected forest, less than 300 meters from existing residential development, and more than 2 km from a suitable main road.</p>
Draft Guideline for Environment Management Plan (2004)	<p>The guideline outlines the necessary measures for preparation of an Environment Management Plan for proposed developments in Ethiopia and the institutional arrangements for implementation of EMPs.</p>
EPA guideline on composting, 2004	<p>This guideline describes the benefits of composting, the types of wastes which can be composted and explains the process of composting and various techniques for using it in solid waste management. The guideline provided four types of composting options: aerobic composting, windrow composting and vermi-composting. However, the guideline does not provide further specifications on the different methods of composting and their possible application with respect to climate variations.</p>
Guideline On Sustainable Industrial Zone/Estate Development	<p>The Guideline was prepared to provide guidance on the development of sustainable eco-industrial zones/estates. It describes the various aspects and issues that need to be considered and implemented during industrial zones development, from site assessment to the physical design of the parks.</p>

Annex 6 – Climate financing options

Table 8: climate financing

Finance source	Relevant criteria of the fund	Project's fit to fund's criteria	Notes
GCF	<p>SWM promotes positive environmental externalities such as air quality, reducing burden of waste in waterways;</p> <p>SWM directly contributes substantially to improvement in waste management contributing to emission reductions</p> <p>Partnership required with GCF Accredited Entity; crucial to have high co-funding ratio</p>	<p>Project provides Improved air quality, Contribution to emissions reduction, Sustainable improvement in waste management</p> <p>Project provides evidence of strengthened adaptive capacity</p> <p>Project is consistent with national climate policy for mitigation and adaptation</p> <p>Scalable across other regions</p> <p>Highlights pathway to green urban development</p>	<p>If integrated and packaged with other projects, a larger total impact is more evident;</p> <p>Evidence needed of capacity to meet targets for MtCO₂e reduced or avoided with MRV system</p> <p>Needs clear evidence of how project will reduce exposure to climate risks</p> <p>Show energy from waste potential, methane capture and re-use</p> <p>Show complementary IP on-site mitigation, SWM and WRM strategies, targets</p>
GEF	<p>Allows multiple projects in program approach</p> <p>LDC specific</p> <p>Supports climate change mitigation, that are NAPA-linked</p> <p>Supports tech transfer for CC mitigation</p>	<p>Supports GHG emissions reductions from landfills coupled with reduction in release of chemical pollutions and contaminants</p> <p>Highlight tech transfer component for landfill and mitigation</p>	<p>GEF projects are not large - full-size project is more than \$ 2 million</p> <p>Good for establishing credibility for new ideas, piloting; less so for mainstreaming</p> <p>Ethiopia currently implementing portfolio of GEF funded projects</p>
PPCR	<p>Contributes directly to achieving objectives of the national strategic plan for climate resilience/CRGE</p> <p>Adaptation focused</p> <p>Use of hydro-met information in planning</p> <p>Grant and loan mix</p>	<p>Good fit strategic plan for climate resilience at sector, regional and Woreda levels</p> <p>Feasibility plan will ensure climate data underlies design of outputs and targets</p> <p>While mitigation oriented with environmental improvements, project has adaptation co-benefits</p>	<p>PPCR is designing multi donor multi-sector investment facility with pipeline of projects.</p> <p>Early inclusion of project in discussions is crucial</p> <p>PPCR currently working to design projects for GCF eligibility</p> <p>Show compliance with all WB safeguards</p> <p>PPCR is new in Ethiopia</p>
CDM	<p>Certified emissions reduction (CER) credits must be produced for sale;</p>	<p>Waste handling and disposal is a recognized CDM category – if it involves methane flaring</p>	<p>CDM is complicated; new for Ethiopia;</p> <p>Readiness effort large for small amount of anticipated revenue;</p>

	Sources must have a positive economic rate of return and be a profitable enterprise (revenue from CERs should be surplus profit not essential revenue to make business profitable)	and/or electricity generation	Low likelihood of carrying out MRV regularly for CER validation; See UNDP assessment of challenges: http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/strategic_themes/climate_change/carbon_finance/CDM/ethiopia_opportunities.html
--	--	-------------------------------	---

Annexes
*Project 2 - Water
Resource
Management
project*

Annex 7 - Policies and strategies

Key policies and strategies	Description (objectives, main instruments, provision, key issues and gaps)
Growth and Transformation Plan 2014/15 – 2019/20	GTP II aims to achieve universal access to water supply and sanitation across the country. In urban areas, the Plan aims to provide 75% water supply access coverage with upgraded minimum urban utilities service levels of 100 l/c/day, 80 l/c/day, 60 l/c/day, 40 l/c/day and 30 l/c/day for category 1, 2, 3, 4, and 5 ¹ cities and towns respectively. Other water resource management targets for the plan period include: reducing Urban Fault Waters (UFW) from 39 to 20 percent; increasing ground water exploration coverage from 13 to 25 percent; increasing basins and hydrological information systems from 25 to 63 percent.
Climate Resilient Green Economy (CRGE) Strategy 2011	The CRGE Strategy aims to attain middle-income country status and zero carbon growth by 2025. The strategy identifies 60 adaptation initiatives to reduce overall vulnerability to climate change impacts for a total cost US\$ 150 million. The strategy aims to accelerate access to exposed surface water to more resilient sources.
CRGE Water and Energy Strategy 2015	The strategy identifies 11 strategic priorities for adaptation in the water and energy sectors including: balancing water demand; accelerating universal access to WASH; enhancing climate resilience of self-supply through water storage facilities or participatory water resource management. Adaptation options specific to water include: water harvesting technologies, water demand management, water supply and sanitation mapping, among others.
National Water Resources Management Policy 1999	The WRM policy recognizes water as a scarce and vital socio-economic resources and emphasises the need to manage water resources in a sustainable manner. It also recognizes the principles of integrated water resource management (IRWM) and clearly adopts a river basin approach, as a way to ensure that all aspects of water resource management (i.e. management of surface and groundwater resources, water quantity and quality issues, etc.) are not managed in a fragmented manner. It also recognizes the need to integrated water management with other natural resource management and the need for intersectoral coordination at all levels. It calls for decentralized management whereby different functions of water resource management can be devolved to regions and establishment of river basins organisations as well as for the participation of all stakeholders (private sector, community at large). A National Water Sector Strategy was introduced to translate the policy into action, followed by a Water Sector Development.
Water Policy of Ethiopia 1999	The overall goal of the policy is to enhance and promote all national efforts towards the efficient, equitable and optimum utilization of the available Water Resources of Ethiopia for significant socioeconomic development on sustainable basis that incorporate environmental conservation and protection requirements and environmental impact assessment and protection requirements.
Environmental Policy of Ethiopia 1997	The EPE is the overarching policy for climate change and environment-related activities in the country. Key policy objectives with regards to water resources include: i) to promote the protection of the interface between water bodies and land (e.g. lake shores, river banks and wetlands); ii) to involve water resource users, particularly women and animal herders in the formulation and implementation of water policies, programmes and projects; iii) subject all major water conservation, development and management projects to the environmental impact assessment process and to include the costs and benefits of protecting watershed forests, wetlands and other relevant key ecosystems in the economic analysis of such water projects; and iv) promote, to the extent possible, viable measures to artificially recharge ground and surface water resources; v) recycle waste water when it has been found to be safe for health and the environment or when it has been made safe without entailing high cost.

¹ The different categories are based on the population size of cities as follows: category I: population greater than 1 million; category II: 100,000 - 1 million; category III: 50,000 – 100,000; category IV: 20,000 – 50,000; category V: less than 20,000 inhabitants.

Annex 8 - Legislation, regulations and standards pertaining to water resources management

Policies and regulations	Description (objectives, main instruments, provision, key issues and gaps)
FDRE Constitution 1995	<p>The Constitution provides for the public ownership of both rural and urban land as well as all natural resources. Water resources are thus part of the public domain and vested in the State. Further, the Constitution mandates the Federal Government with the responsibility to enact laws for the utilisation and conservation of natural resources including water resources. The Federal Government is also responsible for administering rivers or water channels that link two or more states or crossing the national boundary. The Constitution also provides for the executive arm of the Federal Government or MoWIE to delegate some of its powers and responsibilities (such as the power to issue permits) to Regions if it deems necessary.</p>
Ethiopian Water Resources Management Proclamation (No. 197/2000)	<p>This proclamation is the guiding legal instrument pertaining to water resource management in Ethiopia. Its primary purpose is to ensure that all surface and ground waters of Ethiopia are properly protected and managed. The proclamation stipulates that water resources management shall be based on a permit system. It designates the Ministry of Water, Irrigation and Electricity (MoWIE) as the Supervision body at national level and sets out its powers and duties. MoWIE shall prepare an inventory of water resources. Further, the proclamation states that the use of water for domestic purposes shall have priority over all other water uses. Further, it states that supply of water, transfer of water, release or discharge of water or construction of waterworks requires a permit to be issued by the supervising Body in accordance. Article 12 lists usages for which permits are not required.</p>
Water Resources Management Regulation (No. 115/2005)	<p>The purpose of the regulation is to provide detailed provisions for the effective implementation for the above proclamation. More specifically, it provides more details on requirements for the issuance of permits for different uses of water, construction works, waste water discharges as well as provides the conditions for the issuance, renewal and revocation of such permits.</p>
Water Resources Development Fund Establishment and its Administration Proclamation (No. 268/2002)	<p>The proclamation provides for the establishment of the Water Resources Development Fund, its objectives, resources of the Fund and administration of the Fund. The Fund shall be used to enabling organizations that are engaged in water supply and sanitation services to be fully self-sufficient in the provision of reliable and sustainable services, to contribute to food self-sufficiency by expanding and ensuring water supply for irrigation. The Fund shall also provide long-term loans on the principle of cost recovery for the realization of the objectives.</p>
River Basin Councils and Authorities Proclamation (537/2007)	<p>This proclamation aims to create an enabling environment for the establishment of Rivers Basin Councils and Authorities for each river basin of the country by a phase-by-phase approach and through subsequent subsidiary legislation. It states that River Basins High Councils and Authorities in the country shall be responsible for promoting and monitoring the integrated water resources management process in the river basins falling under their jurisdictions. Key duties of Basin High Council include: (a) providing policy guidance and planning oversight to ensure coordination among stakeholders for the implementation of integrated water resources management in the basin; (b) preparation and submission of the river basin plan for approval by the GoE; and (c) set water allocation rules and principles; and (d) managing water use disputes</p>

	<p>between Regional States in the basin.</p> <p>The Proclamation also defines powers and duties of Basin Authorities and Director Generals of Authorities, in particular in relation with issuing permits relating to water use and water works, river information and river basin management plans.</p>
Environmental Pollution Control Proclamation (No. 300/2002)	The proclamation states that “no person shall pollute or cause any other person to pollute the environment by violating the relevant environmental standard.”The proclamation further indicated that water is one of the sector that need environmental standards.
Public Health Proclamation (No. 200/2000)	The proclamation prohibits the discharge of untreated effluent waste generated from septic tanks, seepage pits and industries into water resource. It also prohibits the disposal of solid of solid or liquid wastes in a manner which contaminates the biophysical, physical or social environments. Additionally, the proclamation includes occupational health control and use of machinery by employees of any given company.
Draft Guidelines on Sustainable Industrial Zone/Estate Development, 2004	The Guideline was prepared to provide guidance on the development of sustainable eco-industrial zones/estates. It describes the various aspects and issues that need to be considered and implemented during industrial zones development, from site assessment to the physical design of the parks.
ESIA Guidelines on Dams and Reservoirs, Hydropower, Water Supply, and Livestock and Rangeland Management (2004)	The guideline focuses on rural and urban water supply projects and highlights major issues and potential impacts that should be taken into account during the preparation and assessment phases. These include impacts on poverty, the environment, population, gender, health outcomes and participation.

Annex 9 – Initiatives /programmes

Initiatives / programmes	Description
<p>One WASH National Program (OWNP)</p> <p>Budget: US\$ 438.7 million</p> <p>Implementing partner: MoWIE, MoH, MoE and MOFEC</p>	<p>The OWNP is the GoE's main instrument for achieving the GTP II and MDGs goals with respect to water supply, sanitation and hygiene in an integrated manner. The programme's Urban WaSH component (20% of total budget) funds capacity building, planning and service improvement activities through grants and water expansion activities are provided on a soft loan basis. The program's water supply interventions is expected to benefit 4.4 million people.</p>
<p>Ethiopia Second Urban Water Supply and Sanitation Project (WaSHP)</p> <p>Budget: US\$ 445 million</p> <p>Implementing partner: National WaSH Steering Committee (NWSC) / World Bank</p>	<p>The Water Supply, Sanitation and Hygiene (WaSHP) in an IDA financed project which aims to help GoE achieve the targets set in the OWNP and GTP II. The project will have three components including an Urban water supply, sanitation and hygiene (U-WaSH, US\$ 101.8 million). Urban water supply activities will focus on two aspects: i) investments aimed at improving water production and distribution systems in about fifty small towns and twenty medium towns, to cover rehabilitation and expansion of services and immediate measures to improve service delivery based on identified priorities; and ii) strengthening the capacity of participating water boards, committees and operators to effectively manage their water supply facilities and improve their operational efficiency. The project will benefit an estimated 2.62 million people (including 1 million in cities) and will have a total budget of US\$ 233.8 million (US\$ 93 million for the U-WASH component).</p>
<p>ULGDP II</p> <p>Budget: US\$</p> <p>Implementing partner: MUDH/ World Bank</p>	<p>The second urban local government development program (ULGDP) aims to improve the institutional performance of participating urban local governments (ULGs) in developing and sustaining urban infrastructure and services. The program's <i>performance-based investments grants</i> component helps finance core infrastructure investments in roads, water supply, sanitation, solid waste, greenery and street lighting to name but a few. Eligible investment areas related to water resource management include: servicing of land with utilities (including water supply), drainage systems, liquid waste infrastructure such as wastewater treatment ponds, sludge ponds, vacuums trucks, etc.</p>
<p>National WaSH Inventory</p> <p>Budget: Unknown</p> <p>Implementing partner: Unknown</p>	<p>The NWA was prepared as part of a major initiative by the GoE and key sector stakeholders to establish a nationwide data base as a monitoring tool for water supply, sanitation and hygiene. NWI results are used as a baseline data for the OWNP.</p>
<p>An Integrated Approach to water sector development to support Ethiopia's paradigm-changing CRGE Strategy</p> <p>Budget: US\$ 10 million</p> <p>Implementing partner: MoWIE</p>	<p>FDRE has developed a project proposal for GCF funding which is intended to begin the implementation of the country's climate resilient water strategy by acting as an innovation hub for the strategy and testing a range of new approaches. Major project components include: Resilient and integrated river basin management; replacement of diesel powered water pumping systems by solar water pumping system for rural WaSH; ultra-lowhead micro-hydro (ULH-MHP); and hydrological information systems.</p> <p>The requested GCF budget is US\$ 10 million. Current status of the project proposal is unknown.</p>

Annex 10– Water demand modelling

Table 9: Summary table of modelled water-usage and demand reduction benefits²

Year	Description		Mek'ele		
	2015	2020	2025	2030	2035
Population (ooos)	337,773	455,057	602,581	775,199	962,972
Domestic water demand (millions/l)	4,340	5,847	7,742	9,960	12,372
Industrial water demand (millions/l)	25,696	25,696	25,696	25,696	25,696
Total water demand (millions/l)	30,036	31,543	33,438	35,656	38,068
Estimated water supply (millions/l)	9,360	9,360	9,360	9,360	9,360
Water deficit (millions/l)	-20,676	-22,183	-24,078	-26,296	-28,708
Low cost demand-side measures					
10% demand reduction	-17,672	-19,028	-20,734	-22,730	-24,901
25% demand reduction	-13,167	-14,297	-15,718	-17,382	-19,191
50% demand reduction	-5,658	-6,411	-7,359	-8,468	-9,674
Low cost demand-side measures + closed-loop water recycling³					
@ 25% demand reduction	2,251	1,121	-301	-1,964	-3,774

Assumptions

Domestic water demand (l/capita/day)	44
Service water coverage	80%
Litres to m3	0.001
Industrial demand	Leather (22ha); Agro (52 ha); Light manufacturing (32.6ha); Apparel and Garments (28.12ha); Construction materials (17.01ha)
Water supply	9.36 million m3/year - held constant e.g. no additional production/increase in supply

² Data sourced from: Population figures; NUDSP (2015); water usage from Mek'ele Industrial Park Environmental Impact Assessment

³ Closed-loop water recycling systems are proposed at both Mek'ele and Kombolcha IPs with an objective of delivering up to 60% recycling of grey water for industrial processes.

Annex 11 – Estimated water usage (IPDC Parks)

Figure 1 – Estimated water usage at Mek’ele IHDP Park (at full occupation)

S.No.	Description	Area (Ha)	Population	Water use Assumptions	Process water (KLD)	Potable water (KLD)	Horticulture demand @4l per 10% of plot area (KLD)
1	Industry	517	134565	Process water assumptions in Table 5-9. 45 LPCD per worker for potable water demand	46817	6055	2070
2	Commercial	10	521		0	23	42
3	Recreational	10	504		0	23	40
4	Facility	16	243		0	11	65
5	Utility	17	50		0	2	0
6	Logistics	14	352		174	16	0
7	Road	91	0		0	0	3656
8	Green & Water Bodies and Open	198	0	0	0	7910	
9	NPA	128	12809	0	1729	512	
Total		1003	149044		46991	7860	14295

Source: Mek’ele Industrial Park Environmental Impact Assessment (2015)

Figure 2 – Estimated water usage at Kombolcha IHDP Park (at full occupation)

S. No.	Description	Area (Ha)	Worker Population	Water use Assumptions	Process water (KLD)	Potable water (KLD)	Horticulture demand @4l per 10% of plot area (KLD)
1	Industrial	281	86692	Process water assumptions in Table 7-4. 45 LPCD per worker for potable water demand	13093	3901	1125
2	Rail based Industry	66	1661		821	75	266
3	Facility	18	231		0	10	74
4	Utility	20	58		0	3	81
5	Logistics	19	487		240	22	78
6	Road	82		-	0	0	0
7	Railway Track	14		-	0	0	0
8	MP Green	73		-	0	0	2936
9	Green Buffer in PA	32		-	0	0	1286
10	Non-processing Area	93	9305	-	0	1256	372
Total		700.89	98434		14154	5267	6218

Source: Kombolcha Industrial Park Environmental Impact Assessment (2015)

Annexes
*Project 3 -Green
housing*

Annex 12 – Climate compatibility of the four main formal delivery systems for housing in Ethiopia⁴

Type	Description (including market segment)	Current national housing stock (%) ⁵	Climate compatibility - costs	Climate compatibility - benefits
Government-built condominiums	<p>Large-scale condominium housing programme aimed at low- and middle-income households, known as the Integrated Housing Development Programme (IHDP). Typically 175 – 300 dwellings per hectare.</p> <p>Further, the GoE plans to develop mega housing projects for sugar and fertilized industry and university housing.</p>	<p>51.1%</p> <p>Approx. X units in Mek'ele and Kombolcha</p>	<ul style="list-style-type: none"> - Primarily constructed from cement (high embodied carbon-energy cost); centrally sourced for cost efficiencies which dis-incentivise the use of local alternatives - Very little post-occupancy monitoring or enforcement e.g. maintenance issues such as localized flooding from blocked drains - Condominiums over 5 stories require mechanical lifts which increases energy demand 	<ul style="list-style-type: none"> - Compact, dense development is a stated aim - Large scale, pro-poor housing which supports a multitude of SMEs along the construction supply chain (albeit tied to cement manufacture and construction) - IHDP is an attempt at preventing slums (see performance of informal residences below) - Open spaces are incorporated into the design for recreational purposes
Residential neighbourhoods initiated by real estate developers	<p>There are currently more than 50 real estate companies operating in Ethiopia mainly targeting the higher end segment of the housing market. Estates like the 'Mizer' Estate proposed in Mek'ele are typically G +1 housing of typically 65-70m²; comprising 3 rooms, a kitchen, a toilet and living area.</p>	<p>0.4 % (private developers) + 0.5% (municipalities)</p>	<ul style="list-style-type: none"> - Some attempts at mixing market segments, though affordability remains an issue - Often located far from city centres where jobs, services and markets are located. - Predominance of cars, car 	<ul style="list-style-type: none"> - Mixed-use designs are more and more common incorporating residences, services and employment uses - Street trees, open and green spaces are incorporated into the design for recreational purposes

⁴ Proportions of housing stock referenced here are the national average. City-specific data was not available

⁵ Source: State of Ethiopian Cities Report, (Ministry of Urban Development and Housing and Ethiopian Civil Service University 2015) n.b. does not include housing units rented by private owners.

			parking spaces and routes for private vehicle use	and provide natural shading and habitat - Drainage, sanitation, and basic service provision considered from the outset
Cooperative housing development:	Typically housing cooperatives comprise of middle-income households. The approach is for residents to organize themselves into small groups (between 10 to 20 people), register as a cooperative group for land allocation, develop savings capacity, prepare settlement plans, and largely build their house themselves incrementally. There are currently more than 80 housing cooperatives registered in Kombolcha alone.	22.2% national	<ul style="list-style-type: none"> - Often less intensive, sub-optimal use of land e.g. core +1 storey housing only - 100% of housing finance to be raised by households themselves – therefore affordability is questionable 	As above
Owner-built housing construction:	Self-built housing covers a wide range of the housing segments, from modest units constructed over an extended period of time to large and luxurious houses. Once the most common housing supply mechanism, owner-built housing has been on the decline since the launch of the IHDP, partly due to higher construction costs. One feature which characterises recent informal settlements in Ethiopia is the fact that they are not necessarily poor. They often comprise good quality houses built by middle-income households driven out from city centres.	c. 30.2%	<ul style="list-style-type: none"> - corrugated iron sheeting and concrete used for roof and floors respectively - relatively high cost of providing basic urban infrastructure and services particularly with low density scattered development on the urban periphery (Ethiopia Urbanization Review, 2015). - Construction often have weak resilience to extreme weather-events and lack of basic services puts population at risk from public and environmental health hazards e.g. water borne diseases 	<ul style="list-style-type: none"> - Use of local materials e.g. 'chikka' (wattle and daub); round tree lengths for rafters; sustainability of supply is unclear though low-energy materials - Low-cost of construction

Table 10 - Summary of key policies that relate to housing

Policies and regulations	Description (objectives, main provisions)
Second Growth and Transformation Plan (2014/15 – 2019/2020)	The Growth and Transformation Plan (GTP) II sets Ethiopia's vision of attaining middle-income country (MIC) status by 2025 through industrialization and effectively managed urbanization. The Plan aims to build 750,000 new residential units in cities and improve the provision of standard urban house by 30%. In addition, Government is committed to improve the condition of squatter/ slum houses or informal settlement by 20% using the base line of the 2007 census.
Climate Resilient Green Economy (CRGE) Vision	The CRGE strategy outlines Ethiopia's ambition of attaining lower middle-income (LMIC) status by 2025 while limiting 2030 GHG emissions to around today's 150 Mt CO ₂ e. The CRGE identifies 6 priority intervention areas for reducing GHG emissions: Agriculture, Forestry, Water & Energy, Industry, Transport and Urban Development. The aim initiative in the housing sector is to accelerate the transition to high efficiency light bulbs in urban residential and commercial units. This should provide an abatement potential of approximately 5.1 Mt CO ₂ e.
Ethiopian Cities Sustainable Prosperity Goals (ECSPGs)	The ECSPGs is the main guiding policy framework for the urban sector to implement GTP II. ECPI's Vision is 'to create economically productive, socially inclusive and environmentally sustainable cities by 2025'. It incorporates the strategic objectives, orientations and targets set out in the Growth and Transformation Plan (GTP) for the urban sector. ECPI's has put forward 9 strategic pillar and 12 programmes, one of which is the Housing Development and Management programme. Under this programme, the GoE plans to build 750,000 new urban residential housing units and to improve the provision of standard houses by 30 percent. Efforts will also be made to reduce the coverage of slum settlements to around 20%. In rural areas, the government targets to build 3.4 million housing units reflecting local cultural values and conditions. In addition, the GoE plans to draft and implement a strategy that supports and promotes household saving during the planning period.
National Urban Development Spatial Plan	The NUSDP provides a Vision and a roadmap for the development of the Ethiopian urban sector to 2035. The proposed spatial structure is characterised and driven by 10 main urban clusters that will support and underpin the economic transformation of the country and promote inclusive and sustainable urban development. Out of the 10 urban clusters to receive priority support, one is the Mek'ele urban cluster and the second one is the Kombolcha-Dessie Urban Cluster. Both urban clusters are currently linked by a national highway and will be further interlinked by the Awash – Weldiya/Hara Gebeya – Mek'ele railway currently under construction. With regards to housing, the NUDSP forecasts that 6 million more housing units will be needed between 2015 and 13 million more units between 2025 and 2035 to accommodate the growth in urban population.
Climate Resilience Strategy: Urban Development and Housing (draft, 2017)	The purpose of the CRS is to streamline the CRGE strategy in the urban sector. More specifically, it aims to identify the impact of both current weather variability and future climate change on Ethiopia ('challenge'), to highlight options for building climate resilience ('response') and to understand how these options can be delivered ('making it happen').
Urban Housing Provision Strategic Framework, 2013	The framework sets out the different housing delivery mechanisms for the country. It identifies the various government housing programmes (10/90, 20/80 and 40/60 modalities) as one of the main housing delivery channels. The framework also revitalizes housing cooperatives in the country and authorizes foreign investors who can build more than 1,000 units to enter the real estate market.
Urban Land Lease Policy	The urban land lease policy is one of the major policy interventions made by the government to allocate urban land for residential housing. The urban land lease policy is also intended to create a steady source of revenue for municipalities that can be used for the improvement of urban facilities.

Annex 13 – Housing types

Kebele housing

The vast majority (close to 70 percent) of slum houses comprise of government owned rental houses, also known as Kebele rental housing. Although Kebele houses were recognized as formal by the Government in 1975, they are still characterized as slums due to overcrowding and overall lack of key amenities such as drinking water, sanitation, cooking facilities, etc. In 2007, Kebele rental houses constitute up to 24 percent of housing in Addis Ababa and roughly 20 percent of housing on average in urban areas. The majority of low-income Ethiopians reside in rented Kebele housing. The GoE has ambitious plans of reducing the slum area coverage to only 20 percent. It aims to achieve this through effective land preparation in urban expansions and the implementation of urban redevelopment and renewal programs in Metropolis, Regiopolis tier towns, as stated in the Ethiopian Cities Sustainable Development Goal (ECSPG).

The Integrated Housing Development Program (IHDP)

In 2004, the GoE launched the Integrated Housing Development Program (IHDP), a large-scale condominium construction program aimed at providing affordable housing to low- and middle-income households across the country. Implemented in Addis Ababa and 55 other cities, the programme aimed to build 400,000 housing units, create 200,000 jobs, promote the development of 10,000 micro- and small-enterprises in the construction industry, and deliver 6,000 hectares of serviced land for housing and other investments between 2006 and 2010.

During the first phase of the programme, a total of 171,000 housing units were built, a significant achievement considering the previously limited capacity of the Ethiopian housing sector. Additionally, evidence suggests that the IHPD contributed to stemming the housing shortage, reducing the cost of rent for dwelling at the national scale and strengthened the capacity of the country's construction sector. By creating job opportunities in urban areas and allowing low income groups to become homeowners, the IHDP has not only has a positive impact on the country's housing sector but has also acted as a wealth generation program for low-income urban dwellers. Despite these achievements, the IHDP has also faced some serious challenges and setbacks. Important among these is the lack of affordability of the condominium units. Although the program targeted low income segments of the population, the poorest of the urban poor could not afford to pay the initial down-payments and the monthly service charges and mortgage repayments. The affordability problem was particularly severe in secondary cities where the purchasing power is significantly lower than that of households in Addis Ababa. As a result of insufficient demand, the program has been discontinued in the regions and the second phase of the IHDP is only being implemented in Addis Ababa.

Under the second phase, three housing schemes: low-income housing development (i.e. 10/90 option); condominium development (20/80 option); saving housing development for middle income group (40/60 option). Each option is financed through a down payment equalling 10, 20 or 40 percent of the unit cost, and then the rest is paid through a mortgage. The different schemes accommodate monthly earnings ranging from US\$23 to US\$ 138. Construction is taking place at 13 different sites in the capital and the new condominiums that are being built will be 18 storey buildings.

Annex 14 – Design Competitions

Hannover Germany

Shortly after the collapse of the Berlin Wall in 1990, the city of **Hannover, Germany** faced a housing shortage as a result of influx of migrants from the former East Germany. The city decided to create new green neighbourhoods on its outskirts. A project comprising the required infrastructure for World Exposition 2000 and 3,000 homes was carried out, comprising of two stages:

1. Political and policy development and planning. This included a series of planning competition in 1992 and 1993 to create new districts which incorporated objectives on sustainable development in housing, landscape, transport and social infrastructure.
2. Implementation and construction of a large scale improvement project and integrating long term development planning.

The winning design comprised features such as space-saving construction through density planning, incorporation of open and green spaces, tree-lined streets and incorporation of social infrastructure such as playgrounds and inner courtyards.

Design for Life competition

Run by Groundwork London and Hammersmith & Fulham Council, invited participants to consider the retrofit of green infrastructure in a neighbourhood to make it more resilient to climate change. The winning design was by Dora Papp, designed for the neighbourhood of **Jósaváros** in Nyíregyháza, in Hungary. Papp's plan is to regroup existing green spaces into new green-chains to run along the inside of the estate. The flat roofs of apartment blocks, shops, garages and community centre would be converted into green roofs growing food and for recreational use, targeting social, economic and environmental benefits. Natural green walls would be established on walls without windows.

The Designing Resilience in Asia (DRIA) is an International Research Programme on urban and architecture resilience launched in 2014, and based in **Singapore**. It has been running design competitions targeting resilience measures, for example the brief in the 2017 competition invites proposals on innovative water management solutions at the urban planning, urban design, architecture, landscape, building technology or the industrial design scales to tackle challenges on drought and water scarcity.

Global Collaborative Design Competition for Kenya

UN-Habitat and Kenya's Ministry of Transport, Infrastructure, Housing and Urban Development are conducting an urban development design competition, through the International Design Collaboration for Kenya (IDCK). Through this design competition UN-Habitat and The State Department of Housing and Urban Development sought to create a momentum for greater urban design application by demonstrating the value of urban design in implementing newly drafted city/town plans in Kenya. It targeted nine cities/towns in Kenya: Mombasa, Malindi, Kitui, Machakos, Kiambu, Nyeri, Embu, Nakuru and Naivasha.

Building Trust International

Building Trust is a non-profit charity founded in 2010. They hold design competitions for sustainable and affordable housing made of bamboo. An example housing project is 'Framework Housing' in Phnom Penh, Cambodia, which works closely with Habitat for Humanity Cambodia. The overall objective of the project is to find suitable, sustainable solutions for better housing compared with the current large number of informal settlements in the centre of Phnom Penh. The project aims to address two critical areas:

1. The right to land with formal titles;
2. Sustainably design houses that allow families to decide upon a layout that reflects their lifestyle and needs, which they can invest in and develop over time.

World Design Capital (WDC)

In partnership with City of Cape Town, a community-led initiative is promoting safer, more dignified public spaces and showcasing the value in upgrading informal settlements through creating a more orderly arrangement of dwellings than the tightly packed shacks.

Nearly 500 people in 250 households have benefited from the initiative, which has allowed the City to be able to install basic services that requires internal streets for the laying of pipes. The city will provide sewer and water lines, as well as electrical poles and electrical boxes for each family. To further protect against fires, the community is hoping to use fire-resistant materials when re-building their houses. This project was the first of 21 participatory incremental upgrading projects to be completed under a Memorandum of Understanding between the City of Cape Town, the Community Organisation Resource Centre (CORC) and the Informal Settlement Network (ISN), signed in April 2012.

Mass Housing Competition

The Mass Housing Competition is an international housing design competition in partnership with UN-Habitat to promote a new urban planning paradigm, which calls for planning in advance at the scale of expected development of cities with a better integration of urban uses - housing, business, retail, recreation, education, agricultural, social and cultural activities, amongst others, in an environmentally sustainable manner. The competition is global, working in 64 cities within 35 countries. The winner of the last competition in 2014 was designed by Improvistos, who chose to redesign a housing block on the southern outskirts of Valencia with a low occupancy and high unemployment rate. Skills training was in the timber industry was proposed to meet demand for building materials. The housing blocks themselves would utilise empty or under-used apartments by reconfiguring the internal layout and utilizing the space as communal and office space. Externally, wooden additions would reconfigure circulation and add community functions such as rooftop greenhouses.

Annex 15 - Legal framework

Table 11: Policies and regulations

Policies and regulations	Description (objectives, main instruments, provision, key issues and gaps)
Constitution of the Federal Republic of Ethiopia (1995)	The Ethiopian Constitution stipulates that land ownership rights are “exclusively vested in the State and in the peoples of the country.” In other words, there is no private ownership of land in Ethiopia. As the sole supplier of land, the Government through its various branches has not been able to meet the growing demand for land for residential but also types of development.
Urban Land Lease Holding Proclamation (N° 721/2011)	<p>The proclamation repeals the previous lease holding proclamation 9N°272/2003) and provides for the allocation of rights to use land through urban leases, prohibits land possession and permission other than lease holding and provides for the administration of urban land lease holdings.</p> <p>The proclamation also aims to expand the land use revenue base of ULGs. The proclamation stipulates that all land in urban areas was henceforth transferred into a lease system. This includes plots acquired prior to the implementation of the leasehold system in 1993. The lease period is specified based on the nature of development, sector and the type of service. Industry is granted an 80 year lease (70 in Addis Ababa) while the lease period is 99 years for residential housing, science and technology, research and study, government offices, charitable organizations, and religious institutions. The proclamation separates the lease period between Addis Ababa city and other cities for different services. As per latest information quoted in GTP-II, 781 urban centres are now being governed by this lease system. The proclamation includes provision for regularization of informal settlements and a compensation regime for the latter.</p>
Urban Planning Proclamation (N° 574/2008)	<p>The proclamation is one of the main legal frameworks applicable to land use and spatial planning in urban centres in Ethiopia. It establishes a legal framework in order to promote planned and well developed urban centres and regulates and facilitates development activities in urban centres to enhance economic development of the country.</p> <p>The proclamation defines an urban centres as “any locality with established municipality or having a population size of 2 000 or above inhabitants, of which 50 percent of its labour force is primarily engaged in non-agricultural activities”. It gives regional authorities the mandate to demarcate the physical boundaries of urban centres. The proclamation also establishes the hierarchy of plans in the country ranked, in order of priority: National Urban Development Scheme, Regional Urban Development Scheme, city wide structural plans and Local Development Plans. It sets out the procedure for the adoption of plans including public consultation and grants ULGs with the mandate to prepare, approve, implement and review urban plans. It makes provisions for ULGs to expropriate urban land for development purposes on condition that compensation is paid.</p>
Condominium Proclamation N°370/2003	This Proclamation provides rules relative to the establishment, registration and administration of condominium and related rights of condominium owners. The proclamation defines condominium housing as “a building for residential or other purpose with five or more separately owned units and common elements, in a high rise or in a row of houses, and includes the land holding of the building”. The proclamation stipulates that condominiums shall be administered on the basis of a unit owners association, i.e. an association established with a view to obtaining mutual benefits for unit owners other than securing or sharing of profits. It states that owners of units or houses have the right to legally transact with their titles, which may include selling or renting units. The Federal

	proclamation applies to Addis Ababa but has been used by regions for preparing their own condominium proclamations
Ethiopian Building Proclamation (No. 624/2009)	The proclamation outlines the building regulations and requirements, for use by local authorities to ensure building standards are maintained in their jurisdiction. It sets out the minimum national standard for the construction or modification of buildings and alteration of their use in order to ensure public health and safety. The proclamation applies to urban centres with over 10,000 inhabitants. It introduced 3 categories of buildings: A, B and C to get their permits from woreda and municipality Construction Permit & Control Authority. The proclamation stipulates that any person intending to carry out construction shall submit an application to the urban administration. A written declaration of compliance or non-compliance is granted by a building officer. Further, it states that newly constructed multi-storey buildings belonging to category C (public buildings, factory or workshop with a height of more than 12 meters) shall not be put into use before it has been inspected for compliance with the proclamation and a certificate of occupancy has been issued. A building officer may provide an occupancy permit for a partially completed building provided that safety is ensured. Permits are also required for maintenance, demolition and plan improvement. A major gap in this proclamation is the extremely wide requirement for building officers to 'check submitted plan documents to ensure compliance with the provisions of this Proclamation and other laws'.
Urban Landholding Registration Proclamation (N°818/2014)	The proclamation provides for the registration of rights, restrictions and responsibilities relating to urban land. It provides the principles of a legal cadastre and landholding adjudication and registration system. The proclamation defines the Legal Cadastre as 'an updated landholding information system containing a record of the rights, restrictions and responsibilities on a defined legal boundary for each landholding demarcated as a parcel on a map.'
Expropriation of landholdings for Public Purposes and Compensation Proclamation (N°455/2005)	The proclamation establishes the legal principles and framework for expropriation of landholdings and the compensation. The proclamation grants ULGsthe power to expropriate privately occupied urban and rural land for purpose of city development and infrastructure projects such as, construction of dams and other large scale projects. Landholder whose holding has been expropriated shall be entitled to payment of compensation for the assets situated on the land (building, crops, and perennial plants) and for permanent improvements made on the land. The amount of compensation is determined on the basis of replacement cost of the property. The displaced landholder is entitled to a substitute plot of land and a displacement compensation equivalent to ten times the average annual income he/she secured to bring the five years preceding the expropriation of land. A minimum of 90 days notification must be given. The proclamation states that landholders can appeal only after handing over the land. Consequently, evicted landholders can only appeal on the amount and proportionality of the compensation. The conditions of expropriation are considered harsh due to the short period of notice (30 – 90 days), the compensation calculation, which does not take into consideration the value increment of property in relation to its location, losses of income generation due to change in location, as well as the appeal procedures that require the affected party to give up the land to the City while the appeal process is underway.

Annex 16 – Resource efficiency and resilience in building design

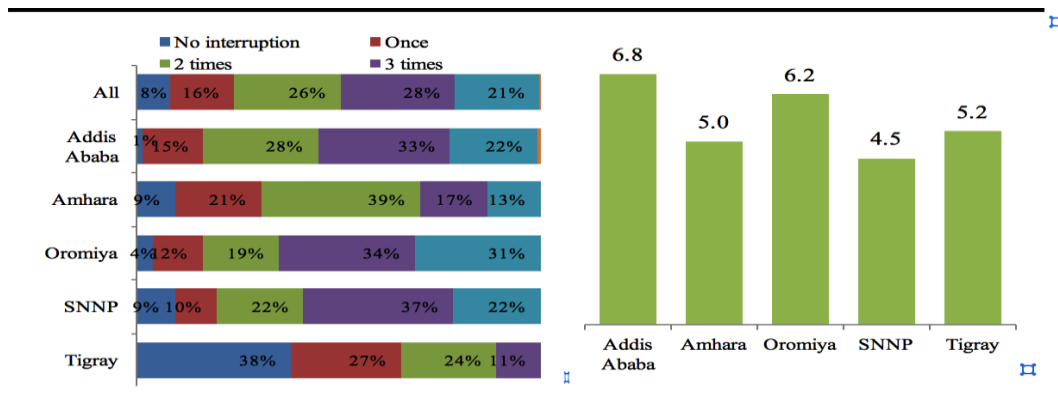
Case study examples of:

Low carbon energy technology e.g. solar panels; off-grid energy;

As it is known the power supply reliability for domestic customers already online, in terms of uninterrupted and consistent quality electricity, appears to have worsened. According to the WMS survey in 2011 more than 85% of households reported that they had power interruptions at least once in the previous week and more than 50% reported the same 3 or more times in the week prior. There is also poor power quality for domestic customers who receive lower voltage level than is standard (220V with $\pm 10\%$), which inhibits them to efficiently run basic household energy devices such as electric mitad, energy cooker, etc.

Similarly, the Lighting Africa, Lighting Market Survey (June 2013) has also confirmed the same (90% of the sample households reported power interruptions at least once in the week prior to the survey and about 40% reported 3 or more power interruptions in the same period, i.e. in the average with the frequency of 2.4 times per week. The same study has also indicated that the duration of the blackouts ranges from 4.5 hours-6.8 hours as it is seen in the chart below.

Frequency of Power Interruptions Last Week and Average Duration (hours)



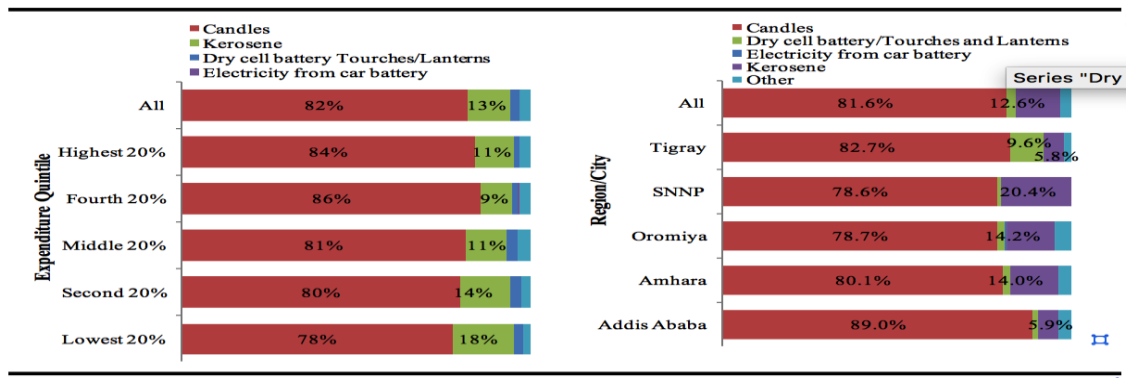
a) Frequency of Power Interruptions during the week prior to the survey (Percent of households)

b) Average duration of single interruptions (hours)

Households are using different backup lighting services during the blackout that is frequent, long lasting even sometimes lasting several days. The more common types that are identified during the LA study are:

- Candles, which cost ETB3 - 4 (US\$0.16 - US\$0.21) each, and last 3 to 4 hours;
- Dry cell battery operated hand torches (flashlights), which cost approximately ETB25 (US\$1.32) for the torch and ETB10 (US\$0.53) for the D-type dry cell batteries used, with a useful life of about a year; and
- Mains charged LED lamps, which range in cost from ETB40 (US\$2.11) to ETB80 (US\$4.21), which last a few months.

Main source of lighting for Urban HHs during Power Interruption by Expenditure Quintile and Region



The following tables shows total number of urban households using electricity for lighting, which are also those suffered with power interruptions.

Number of urban households using electricity for lighting

	Electricity (private)	Electricity (shared)	Total
Country Level	1,265,605 (42%)	1,771,769 (58%)	3,037,374
Tigray	82,283 (40%)	124,038 (60%)	206,321
Amhara	181,701 (31%)	412,391 (69%)	594,092
MeKele	34,186 (47%)	37,868 (53%)	72,054

Source: CSA, Welfare Monitoring Survey, 2011⁶

As it is seen above 82% of households use candles as their primary source of lighting during power interruptions. Hence, the annual expenditure on candles by those households due to the power interruptions is seen in the table below.

⁶ The data for Kombolcha is not included in the WMS report

Table 12: Expenditure on candles⁷

	Per week		Per month		Per year	
	USD	ETB	USD	ETB	USD	ETB
Per hhd	0.25875	6.0375	1.035	24.15	12.42	289.8
Country Level	44,455	15,037,279	2,577,819	60,149,117	30,933,832	721,789,408
Tigray	43,776	1,021,444	175,105	4,085,775	2,101,256	49,029,297
Amhara	26,051	2,941,201	504,206	1,764,804	6,050,471	41,177,647
Mek'ele	15,288	356,721	61,152	1,426,885	733,827	17,122,624

The above table indicates that the urban households lighting market in Ethiopia with relation to only their expenditures for candles during power interruptions, offers significant opportunities for marketing solar lighting solutions which can also provide additional benefits (mobile charging, radio, etc.). The survey also indicated that the overall potential market size for solar lighting in the grid connected areas is estimated at about 2.52 million (i.e. 18% of the total potential market of off grid and grid-connected). The share of small and micro enterprises (mainly retail shops, cafes, and restaurants) is estimated at 8% of which 6% will be from those in off-grid rural areas and 2% from those in urban areas.

Relevance of off-grid solar lighting products for the housing project

Taking the above issue as a baseline scenario, integrating off-grid solar lighting products in the housing project is very practical. The design of the houses will basically play key role on how these products are integrated. In a condominium like design, solar lanterns with different options could be an option. Looking at SHS option, it might be difficult to erect the solar PV for individual houses as per their demand in the inclination where the panel can have the maximum radiation. However, it is also possible to think to have a solar park that can be erected centrally and designed to satisfy the energy demand of all the houses and directly connected to the respective houses. This could be an expensive option, but there can also be a condition where the community can sell the electrical power generated to the grid when there is excess production from the solar park and sustainable power supply form the grid.

Currently the Ethiopian Standard Agency in collaboration with Ethiopian Energy Authority developed mandatory standards for solar lantern, SHS (plug - and - play DC solar home system Kit), solar water heater as well as energy saving lumps. Products must meet the Quality Standards to be eligible for services from Lighting Global and the associated regional programs. For instance, as of June 2015, the following requirements constitute the core of the Lighting Global Quality Standards for pico-products.

- Truth-in-advertising: accurate consumer-facing labelling (e.g., rated run time, light output, battery capacity, PV power)
- Lumen maintenance: after 2,000 hours, the product's light output must not drop below 85% of the initial value (alternatively, products may meet this requirement by achieving 95% of the initial light output after 1,000 hours)
- Battery: must be durable and adequately protected

⁷ As per LA market survey, a candle completely burns out in 3.2 hrs. The exchange rate taken is 1 USD=ETB 23.0541 (NBE - 17.06.17)

- Health and Safety: batteries may not contain mercury or cadmium; products are safe
- Durability and quality: products are designed and manufactured to avoid early failure
- Warranty: products have a consumer-facing warranty with at least one year of coverage
- Performance Information: Product packaging reports run time and brightness along with a note about the impact of mobile phone charging

The products that are going to be integrated in the housing project should also comply with the national as well as international standards. Having street lighting is very imperative to have a secured life in the community. As it is seen in many streets in urban area though the street lights are erected along the street side, their performance is very poor. Even in some cases, they are not functioning at all. In some main roads of Addis Ababa, solar street lighting is replacing an electric power street lighting and also some of newly constructed roads are lighted by solar street lighting.

Hence solar street lighting can be the best option for the housing project to create secured neighbourhood. There are different types of solar street lighting system. The system for the housing project should have up to 12 hours of lighting with just two hours of sunshine with a battery back-up system which can be used in the event of cloudy weather.

Low carbon cook stoves

Table 13: Comparison of CO₂e savings with various cookstoves

	ER-CO ₂	Amount	Remark
Solar Units	kg CO ₂ e/hhd/yr	54.95	displacement of kerosene
Electric mitad	tCO ₂ e/hhd/yr	2.3	displacement of fuelwood
Electric stove	tCO ₂ e/hhd/yr	1.91	displacement of fuelwood
Mirt stove	tCO ₂ e/hhd/yr	1.17	displacement of fuelwood
Tikikil stove	tCO ₂ e/hhd/yr	1.23	displacement of fuelwood
Ethanol stove	tCO ₂ e/hhd/yr	4.44	displacement of fuelwood
Ethanol stove	tCO ₂ e/hhd/yr	0.015	displacement of kerosene

- Energy saving technology e.g. light bulbs
- Design elements in housing that achieve natural cooling/ventilation (e.g. that do not require AC!)
- Green roofs
- Sustainable drainage systems
- Low/no water sanitation systems (composting toilets)

Annex 17 – Housing demand

Mek'ele Housing demand forecast

Housing provision in Mek'ele falls behind its demand due to a number of reasons. This gap can be well explained by carefully scrutinizing components of the demand and the supply sides. In short, the demand side shows the need for housing while the supply side expresses the available housing stock.

Housing supply

The 2007 Population and Housing Census of CSA has revealed that in the city there were about 54,709 housing units. In the same year, the number of households were 59,155 which signify a 4,820 (including 374 homeless) housing deficit at the period considered. The census has discovered that 17% of housing units were made of wood and mud (which needs replacement), 67% from stone, 14% of HCB wall construction materials. As to roof material, 97% were made of corrugated iron sheet. Most of the houses had mud (50.5%) and (37.5%) cement screed floor materials.

According to MCSPP (2014)⁸ and information availed from the City Administration recently, there were different housing provisions in the City from various sources including private developers, public condominiums and plots delivered by the City Administration for residential housing constructions since 2007 as detailed in the table below.

Table 14: Housing Supply in Mek'ele

Year	Private Sector supply (through cooperatives, lease, etc.)	Condominium	Individual builders (2007 to 2013)	Plots recently given for residential housing construction	Plots to be given for residential housing construction	Supply up to the year	Total housing stock (actual number of houses/plot s delivered)
2007						54,709	54,709
2017	2,235 ⁹	3,332 ¹⁰	11,390 ¹¹	11,000 ¹²	29,000 ¹³	56,957	82,666

Source: 1. Mek'ele University, Business and Consultancy Service, 2014
2. Mek'ele City Administration (2017)

One can see from the above table that the actual housing stock has reached 71,666. With the newly delivered 11,000 plots (with the expectation of being built in the near future), the total number of housing units can safely be assumed at 82,000 in 2017 from its about 55,000 in 2007.

⁸ MCSPP: MeKele University, Business and Consultancy Service (2013/14). Situation Analysis on Social Development and Demographic Characteristics.

⁹ Housing units constructed through mode of lease, cooperative housing Dev't strategies (2007 – 2011/12)

¹⁰ 3,332 condo housing units were constructed by the public mainly (90%) for residential purposes.

¹¹ There were 29,000 applicants for plots of which 40% (11,390) achieved from overall housing demand.

¹² About 11,000 residential plots were given to households in 2017 by MeKele City Administration.

¹³ 29,000 plots are planned to be given to the City's households in 2017 and 2018 by the City Administration for residential housing construction.

Housing Demand

Theoretically the demand side for housing is determined or affected by new household formation, net migration and the housing choices of existing households within that urban area (Kenneth Gibb, 2000, pp 6)¹⁴. Others articulate that demand for housing is determined by households' willingness and ability to pay, the location, physical amenities, access to employment, educational facilities, recreation and social characteristics of the neighborhood (Strategic Planning Group, 2005, pp 13)¹⁵. A different factor that indirectly affects housing demand is that housing is no longer viewed solely as shelter; rather, it is a form of investment, a way to keep pace with inflation. In general shifts in the size, age and income of the population; housing costs; and changes in the physical characteristics of an area including blighted structures can affect housing demand (Strategic Planning Group, 2005, pp 14).

Coming to Mek'ele's case, housing demand components covered by this report include new household formation since 2007, housing backlog sustained, replacement of deteriorated housing units and housing requirements due to industrial parks. According to the 2007 population and housing census, Mek'ele had a total population of 215,914 with an average family size of 3.65 per household. The total number of households at the time was 59,155. In 2017, the City's population is forecast at 366,249 with a total of 100,342 households (with similar family size) indicating formation of about 42,000 new families. The number of housing units that actually exist in the City in 2017 is estimated at about 72,000 (by adding houses supplied through condominiums, individual builders, cooperatives, etc.). Adding the 11,000 plots recently given for residential housing development as said before, it is expected that it will be 82,600 soon with understanding of that this number has partly served the newly formed families since 2007. Now, if accumulated backlog up to 2007 (4,820 HUs), backlog between 2007 and 2017 (100,342 HHs minus 82,266 HUs = 17,676 HUs) and replacing the 17% deteriorated housing units built before 2007 (9,301), it can be seen that the City needs additional 31,796 housing units in 2017 alone. If the promised delivery of 29,000 plots for residential development are supplied as planned, this demand gap in the year would be significantly lowered to 2,796. But since this is not yet delivered, the number is excluded from the demand computation. Demand for the newly formed families has been computed for the years 2018 onwards.

The other demand component comes from the three Industrial parks in Mek'ele (Velocity, DBL and MIP) as they are expected to create employment opportunity to about 100,000 individuals upon their completion and full operations. Here it is assumed that housing units will be constructed for about half of the population (10,000 HUs/per annum for five years) with the remaining balance expected to be accommodated in the already built houses in the form of rent and other modalities.

14 Kenneth Gibb ; Modelling housing choice and demand in a social housing system: the case of Glasgow; Program on housing and urban policy , Seminar paper series ; Institute of Business and Economic Research , University of Glasgow and Berkley , January 2000.

15 Workforce housing study, city of fort Lauderdale; Strategic Planning Group inc.,; 2453 south 3rd street , Jacksonville, fl 3 2250 , (800) 213 – plan, December 14, 2005 Florida ,USA.

Table 15: Demand for housing in Mek'ele

Year	Population size ¹⁶	Family size ¹⁷	No. of HHs ¹⁸	No. of Hus (supply) ¹⁹	Demand components				
					Accumulated Backlog (before 2007) ²⁰	Existing Backlog (between 2007 and 2017) ²¹	Replacing deteriorated units ²²	Housing demand due to Industrial Parks ²³	Total Additional demand (2017 to 2025) ²⁴
2007	215,914	3.65	59,155	54,709	4,820				
2017	366,249	3.65	100,342	82,666	4,820	17,676	9,301	50,000	125,887

The total housing demand was then cascaded into different income groups. Proportion of income groups by Mek'ele City Plan Preparation Project Office (2006). Accordingly high, middle and low income groups have been computed using 5%, 21% and 74% proportions. The following table forecasts housing demand up to year 2026 based on the facts and assumptions discussed above.

Table 16: Forecast average annual housing demand and cost of delivering housing to three distinct market segments

Market segment (income groups)	Housing type example	Average plot size	Total demand for Units per annum (average) ²⁵	CAPEX (unit cost of construction, land, infra) ETB	Total cost range for delivering formal housing ETB (Millions)
High-income > 5000 ETB/month	Formal housing market e.g. middle class suburban housing e.g. Mizer scheme in Mek'ele	70 m ²	629	83,700	52.7
Medium-income 1,500 – 5000 ETB/month	Housing cooperatives	NA	2644	16,000 – 50,000 ²⁶	42.3 – 132.2
	IHDP (i.e. condominium)	25 m ²		NA	
Low-income 750 – 1500 ETB/month	Dormitory housing	4 m ²	9316	20,000 – 37,000	186.3 – 344.7

¹⁶ Source: CSA (2007), Population and Housing census of Ethiopia and population forecast based on CSA data.

¹⁷ Source: CSA (2007), Population and Housing census of Ethiopia

¹⁸ Obtained by dividing population in the year with average family size

¹⁹ CSA (2007), Population and Housing census of Ethiopia and housing supply data up to 2017

²⁰ Based on CSA (2007) population and housing census of Ethiopia, results for Mekele City and adding 374 homeless in the year 2007.

²¹ Difference between Number of households and housing units in the year

²² 17% made of wood and mud wall built before 2007 CSA (2007) population and housing census of Ethiopia, results for Mekele City.

²³ Assuming that 50% of IP employees will have access to new housing units

²⁴ This doesn't include demand for new housing units by additional families formed beyond year 2018

²⁵ Demand estimates for Mek'ele – see Annex 4

²⁶ Based on a range of sizes from studio apartment (>20m²) to 3 bedroom apartment (45m²). Note in order to keep costs down, condominium apartments are sold/let with only basic levels of finishing. (UN-HABITAT 2011)

Total			12,589		281.3 – 529.6
--------------	--	--	---------------	--	----------------------

Assumptions/limitations

- Urban growth projections – population growth rate here for Mek’ele is assumed at 4.13% p.a (2017 – 2025)
- Self-build (slum) housing is phased out overtime. GoE policy objective to reduce to 20% over GTPII and equally as incomes and housing consumption rise, housing demand will vary.
- Urban household size is held constant in this model at 3.65 persons per household, though this is likely to reduce over time (demand for housing larger units drops) as incomes rise
- Inward migration trends hold (as modelled for growth of industrial parks/urban economies) - it is assumed that 50% of the expected 1 00,000 employees of the Industrial parks will need housing units with the remaining half expected to dwell in existing housing stock
- Input cost of materials holds e.g. availability of low-cost manual labour
- US\$ 1/day with birr exchange rate 23.17 to the dollar as at 25th June 201
- The target population is understood to be the total population of those occupying new housing units built to satisfy total average annual housing demand.

Table 17:
Forecast

Table 17: housing demand for Mek'ele

Year	Pop.	No. of HHs ²⁷	Supply		Demand					Forecasted demand ²⁸				
			No. of HUs	Backlog (up to 2007)	Backlog between 2007 - 2017	New Families formed since 2007	Additional housing units required for new families	Replacing deteriorated units ²⁹	Housing demand due to Industrial Parks	Total Demand	Total Effective demand	High Income (5%)	Middle income (21%)	Low income (74%)
2017	366,249	100,342	82,666	4,820	17,676	41,188		9,301		31,796	31,796	1,590	6,677	23,529
2018	381,375	104,486				45,332	4,144		10,000	14,144	14,144	707	2,970	10,467
2019	397,126	108,802				49,647	4,315		10,000	14,315	14,315	716	3,006	10,593
2020	413,528	113,295				54,141	4,494		10,000	14,494	14,494	725	3,044	10,725
2021	430,606	117,974				58,820	4,679		10,000	14,679	14,679	734	3,083	10,863
2022	448,390	122,847				63,692	4,872		10,000	14,872	14,872	744	3,123	11,006
2023	466,909	127,920				68,766	5,074			5,074	5,074	254	1,065	3,754
2024	486,192	133,203				74,049	5,283			5,283	5,283	264	1,109	3,909
2025	506,272	138,705				79,550	5,501			5,501	5,501	275	1,155	4,071
2026	527,181	144,433				85,279	5,729			5,729	5,729	286	1,203	4,239
									50,000	125,887		6,295	26,435	93,156

²⁷ N.b. household size is assumed to remain constant at 3.65 persons per household.

²⁸ Report on Spatial Development Framework (2006). MeKele City Plan Preparation Project Office, MeKele.

²⁹ 17% made of wood and mud wall

This document is an output from a project commissioned through the Climate and Development Knowledge Network (CDKN). CDKN is a programme funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. The views expressed and information contained in it are not necessarily those of or endorsed by DFID, DGIS or the entities managing the delivery of CDKN, which can accept no responsibility or liability for such views, completeness or accuracy of the information or for any reliance placed on them. This publication has been prepared for general guidance on matters of interest only, and does not constitute professional advice. You should not act upon the information contained in this publication without obtaining specific professional advice. No representation or warranty (express or implied) is given as to the accuracy or completeness of the information contained in this publication, and, to the extent permitted by law, the entities managing the delivery of CDKN do not accept or assume any liability, responsibility or duty of care for any consequences of you or anyone else acting, or refraining from acting, in reliance on the information contained in this publication or for any decision based on it. CDKN is led and administered by PricewaterhouseCoopers LLP. Management of the delivery of CDKN is undertaken by PricewaterhouseCoopers LLP, and an alliance of organisations including Fundación Futuro Latinoamericano, LEAD Pakistan, the Overseas Development Institute, and SouthSouthNorth. Copyright © 2017, Climate and Development Knowledge Network. All rights reserved.