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Urban Infrastructure Research

A Review of Ethiopian Cities

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Dedicated to my parents:
Mrs. Asha Tiwari and Mr. Ram Adhar Tiwari

Preface and Acknowledgement

Modern Ethiopia is undergoing rapid urban transformation. The pace of change in cities and towns is unprecedented indeed; many international and local organizations have also endorsed the same statistic. Besides the amazing changes and growth which are taking place, cities in Ethiopia are faced with multifarious and complex challenges.

Previous studies sanction the veracity of the huge gap that exists between the supply and their persisting demand for urban infrastructure and services in the urban centres of Ethiopia; supplies further fail to amalgamate concurrent concerns such as environmental sustainability, employment generation, poverty eradication, gender, and partnerships with the community and private sector. It was also realized that there is a wide capacity gap among public servants, who are responsible for the policymaking and execution of the projects and programmes related to the urban infrastructure sector.

Urban Management Masters Programme (UMMP), at Ethiopian Civil Service University, Addis Ababa, is an ambitious capacity building programme for urban professionals working in the public sector. While working as a course coordinator at this academic programme, I realized that the participants of UMMP have ended with pertinent and vital research projects from different parts of urban Ethiopia covering a range of topics related to urban infrastructure and services; however, the findings of these projects have remained unpublished. This point motivated me to conduct a review for the broader academic and professional community, who have some sort of curiosity regarding contemporary urban issues of the global south in general and especially in the low income countries like Ethiopia.

I believe that this book will set an agenda of research for urban infrastructure researchers in Ethiopia. I am extremely thankful to all my students at the Ethiopian Civil Service University, who hold intense thrust for the development of Ethiopia as research investigators.

Further, I offer my gratitude to Dr. Samson Kassahun, Academic Vice-President, Ethiopian Civil Service University, Addis Ababa, Ethiopia, and Dr. Mohammed Aljoufie, Dean, Faculty of Environment Design, King Abdulaziz University,

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Finally, I am thankful to my wife Kavita, son Kavyansh, and daughters Alokita and Anuja for their emotional support in this review.

Jeddah
December 2015

Contents

Acronyms/Abbreviations

AACA	Addis Ababa City Administration
AAWSA	Addis Ababa Water and Sewerage Authority (City Administration of Addis Ababa; Ethiopia)
AIDS	Acquired Immune Deficiency Syndrome
AMREF	African Medical Research and Education Foundation
BBC	British Broadcasting Corporation
BDCA	Bahir Dar City Administration
BOT	Build-Operate-Transfer (a PPP model)
BPR	Business Process Reengineering
BSC	Balanced Scorecard
CBOs	Community-Based Organizations
CLD	Causal Loop Diagram
CSA	Central Statistical Agency of Ethiopia
CSIRO	Commonwealth Science and Industrial Research Organisation (Clayton South, Victoria, Australia)
DDCDEO	Dire Dawa Cooperatives Developments and Expansion Office
DDFEDO	Dire Dawa Finance Economic and Developments Office
DDMO	Dire Dawa Municipal Office
DDRA	Dire Dawa Roads Authority
DWSSO	Dessie Water Supply and Sewerage Office
EEPCO	Ethiopian Electric Power Corporation
ESMAP	Energy Sector Management Assistance Programme (World Bank)
ETC	Ethiopian Telecommunication Corporation (now known as Ethio Telecom)
EU	European Union
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit, GmbH (German: German Society for International Cooperation, Ltd.)

GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH (German: German Agency for Technical Cooperation)
HIV	Human Immunodeficiency Virus
ICT	Information and Communication Technology
IT	Information Technology
I-TECH	International Training and Education Center on HIV (University of Washington; Seattle, WA)
JWSO	Jig-Jiga Water Supply Office
LAN	Local Area Network
LCA	Life Cycle Assessment
LCD	Liquid Crystal Display (display technology)
MDG	Millennium Development Goals (UN)
MHMRS	Ministry of Health and Ministry Responsible for Seniors (Canada)
MSEs	Micro and Small Enterprises
MWR	Ministry of Water Resources (Ethiopia)
NGOs	Non-governmental Organizations
PEST	Political Economical Social Technological
PPP	Public Private Partnership
RMSEDA	Regional Micro and Small Enterprises Development Agency
SNNPR	Southern Nations, Nationalities, and Peoples' Region
SWOT	Strengths, Weaknesses, Opportunities and Threats
UFW	Unaccounted for Water (water distribution network)
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-HABITAT	United Nations Human Settlements Programme
UNICEF	United Nations International Children's Emergency Fund (now United Nations Children's Fund)
US-AID	United States Agency for International Development
USD	United States Dollar (currency of the USA)
WAN	Wide Area Network
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environment and Development
WHO	World Health Organization

Chapter 1
An Overview of Contemporary Urban Infrastructure Research

Abstract This chapter gives an outline of the ongoing global policy interventions and initiatives associated to urban infrastructure. Topics such as sustainability and urban infrastructure, ICT-driven smart city infrastructure, innovative financing and partnership options with the community and private sector are the core subject matter.

Keywords Sustainability · ICT · Smart city · Eco-efficiency · Urban metabolism · PPP · Community partnerships

1.1 Introduction

Cities are complex, diverse and dynamic entities. It has a dense population in comparison to its rural counterparts. A city requires a well-structured skeleton, upon which the city can flourish; it is in fact known as infrastructure. City for its residents is a site which fulfils not only their basic needs, but also offers plenty of different products and services to be consumed. Dwellers of a city can also comprehend their dreams, desires and many more facets of life. Moreover, a city can also provide people pleasure and satisfaction which can be translated into better quality of life and well-being, whether individually or collectively. Therefore, the city is made of two essential elements, space and population, but to make cities liveable and competitive in the era of globalization, to cope up with the challenges created by climate change, to ensure sustainable development for all its dwellers and to assure its prosperity efficient, adequate urban infrastructure must be promised.

Regrettably, if a city failed to make available adequate urban infrastructure to its dwellers, it can start up a series of negative consequences, including plunge in the urban health and adverse impact on the local economy, environment, aesthetics and attractiveness.

State of the World's Cities 2012/2013 report recognized infrastructure as an essential base for prosperity (UN-HABITAT 2013). A city could not be imagined

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without its infrastructure which is an integral part of the urban fabric, a basic foundation on which a city can bloom.

Recent researches on urban infrastructure predominantly deal with the topics such as sustainability, smart city technologies, innovative financing and management mechanism that are briefly discussed further in this chapter.

1.2 Urban Infrastructure Sustainability

The Brundtland Commission defined sustainability as a paradigm that aims to meet the needs of the present generation without compromising the capabilities of future generations (WCED 1987). Cities are known as bigger consumer of the world's environmental resources (World Bank 1996); as their infrastructures control and regulate the flow of environmental resources, they are well pertinent for sustainability attentions (Hardoy et al. 2001).

In fact, sustainability of urban infrastructures, including water supply, sanitation, storm water, drainage, sewerage and solid-waste management, is a prerequisite for any planned enhancement of a city's environment. Swilling (2006) has identified some essential elements for the sustainable functioning of infrastructure, as promoting energy efficiency, waste minimization and reuse, resource efficiency in construction, mass transportation, stress to grow food locally, efficient water uses and reuse of treated sewerage, biodiversity enhancements, valuing participation and diversity, equity, health and well-being with fair trade at all levels.

Eco-efficiency is an indicator of sustainability initially evolved by WBCSD 2000 aimed at reducing resource consumption, reducing the impact on nature while increasing product or service value. The concept was later adopted by the United Nations after modifications and the addition of social inclusiveness. Creating eco-efficient and socially inclusive urban infrastructure can improve competitiveness of a city and the quality of life of its inhabitants, including the poor, through environmentally sustainable urban development; cities like Curitiba (Brazil), Seoul (South Korea), Singapore and Bogota (Colombia) are the best examples (United Nations 2011; Jordán and Infante 2012).

Made up over many decades, a city can be perceived as complex and interconnected infrastructure system to handle wide-ranging and gigantic resource flows needed to back people's prosperity (UNEP 2013). Some scientists appreciated city as a living entity describing the constant flow of resource inputs (water, land, energy and raw materials) and outputs (services, products, refuse and wastes, etc.) as a city's metabolism (Ravetz 2000) and it is the infrastructure which can keep this flow (metabolic) healthy.

Low-carbon urbanism has set a new agenda for urban infrastructure research; this type of approach can be achieved through retrofitting, replacing and expanding existing urban infrastructures (Chan et al. 2013; Bulkeley et al. 2014; Li 2014).

Consequently, it is very clear that offering sustainable infrastructure is a top priority considering the environmental stress in the cities as they regulate and control resource flow to keep the urban environment healthy and also to ensure and improve 'Quality of Life' for city dwellers.

1.3 Smart City and Urban Infrastructure

'Smart City' is a phenomenon, completely reliant on sensors and ICT infrastructure aiming to make cities clean, green and most importantly safe places to live in. Komninos (2006) deliberated smart cities with high potentials of creativity, learning, innovations and knowledge creating in a digital environment. The EU has attempted a strategy for attaining urban growth in a 'smart' way for its metropolitan areas, which is a wired, ICT-driven form of development (Caragliu et. al. 2011).

Although initially Hollands (Peterson 2008) raised his concerns about the legitimacy of smart city, in his article 'will the real smart city please stand up?', now it is turning into reality as cities like Amsterdam are now emphasizing on the innovations to make them more resource efficient with the added benefits of ICT and sensing technologies (ASC 2014). It is expected that application ICT technologies would cut 7.8 billion tonnes of global carbon emissions by 2020 (TCG 2008), whilst it is believed that 90 % of this diminution will occur because of adopting smart city technologies.

Based on the city challenges, companies are offering numerous smart city software solutions for smart and integrated water management. In fact, smart city concept rotates around endless knowledge acquisitions, motivations, quantifications, scrutinies and alterations, thereafter. This concept is made of multiple ingredients inclusive of smart economy, smart movements, smart citizen, smart governance, smart life style and smart environment. In a smart city project at the first ICT acts as an infrastructure and second the ICT infrastructure regulates, controls and sometimes alters other urban public and private infrastructure and services by astute decision-making based on information generated through sensing of the city pulse with constant and critical monitoring and measurements.

1.4 Innovative Financing of Urban Infrastructure

Peterson (2008) pointed out the significance of land base financing of urban infrastructure provision, especially in the fast-growing cityscapes. As a supplement of borrowing, land base financing triggers direct revenues that cut necessity of future debts and its associated jeopardies.

Link between urban infrastructure planning and urban infrastructure financing is often overlooked, while city governments mainly in developing countries are facing a variety of constraints to finance their infrastructure through traditional methods

(local taxes, grants from central governments, external funding, etc.), hence looking for new and innovative financing mechanism to fulfil the fast-growing demand of urban infrastructures.

The World Bank has estimated that 1 trillion USD is required annually in developing countries to close the infrastructure gap between what is needed and what is built, at present (World Bank 2014).

Current urban financing waves come in two parts: first to check the financial health of the city and city governments in the form of credit rating; and second to offer solutions best fitting to local needs. As a solution, PPP has emerged as a viable option to ease management and financing constraints on urban infrastructure and services, which local governments in developing countries are facing (Narayan 2013).

Actually, PPP is an exclusive type of contract between government and private sector, in which government keeps decisive obligation on offering infrastructure and services and delegate partnerships with private sector in management, financing and delivery thereof. Service contracts, management contracts, lease, concession and BOT (Build–operate–transfer) are some PPP options that are successfully being practiced worldwide (Forrer et al. 2010).

1.5 Conclusion

There is no doubt that robust urban infrastructure and services are very fulcrum of socio-economic development and environmental improvement of our cities. Some contemporary paradigms are discussed in this chapter, which has occupied and guided the whole research agenda dealing with urban infrastructure and services. At first, sustainability of urban infrastructure is prerequisite to keep the hope alive for future generations and fulfil the needs of current generation for a planet that is already resource constrained. Second, idea of smart city is an initiative to efficient provision, management, operation, control and monitoring of urban infrastructure and services in real time, by entrenching advanced ICT tools and applications in the process. Finally, land base financing is a mechanism of financing which is becoming very popular in developing countries, while PPP is an instrument to involve private sector in management, operation and delivery of urban infrastructure and services.

References

ASC—Amsterdam Smart City (2014) http://amsterdamsmartcity.com. Accessed 18 June 2015

Bulkeley H, Broto VC, Anne Maassen A (2014) Low-carbon Transitions and the Reconfiguration of Urban Infrastructure. Urban Studies, Special issue article: Urban energy transitions: places, processes and politics of socio-technical change. Urban Stud 51(7):1471–1486

Caragliu A, Bo CD, Nijkamp P (2011) Smart cities in Europe. J Urban Technol 18(2):65–82. doi:10.1080/10630732.2011.601117

Chan EHW, Choy LHT, Yung EHK (2013) Editorial—Current research on low-carbon cities and institutional responses. Habitat Int 37:1–3 (2013)

Forrer J, Kee JE, Newcomer KE, Boyer E (2010) Public private partnership and public accountability questioned. Public Adm Rev 70:475–484

Hardoy JE, Mitlin D, Satterthwaite D (2001) Environmental problems in an urbanizing world. Earthscan, London

Jordán R, Infante B (2012) A strategic planning approach for developing eco-efficient and socially inclusive urban infrastructure. Local Env Int J Justice Sustain 17(5):533–544. doi:10.1080/13549839.2012.680278

Komninos N (2006) The architecture of intelligent cities: integrating human, collective and artificial intelligence to enhance knowledge and innovation. In: 2nd IET international conference on intelligent environments, 2006, IE 06, vol 1. IET, pp. 13–20

Li Y (2014) Low carbon eco-city: new approach for Chinese urbanization. Habitat Int 44 (2014):102–110

Narayan V (2013) Public private partnership for urban infrastructure & services in India. Int J Logistics Supply Chain Manage Perspect 2(3):405–410

Peterson GE (2008) Unlocking land values for urban infrastructure finance. World Bank Publications, Herndon, VA, USA

Ravetz J (2000) City Region 2020: integrated planning for a sustainable environment. Earthscan, London

Swilling M (2006) Sustainability and infrastructure planning in South Africa: a Cape Town case study. Env Urbanization 18:23. doi:10.1177/0956247806063939

TCG-The Climate Group (2008) SMART 2020: enabling the low carbon economy in the information age, A report by The Climate Group on behalf of the Global e Sustainability Initiative (GeSI). https://www.greenbiz.com/sites/default/files/document/Smart-2020-Report.pdf. Accessed 21 June 2014

Swilling M, Robinson B, Marvin S, Hodson M, UNEP (2013) City-Level Decoupling: Urban resource flows and the governance of infrastructure transitions. A Report of the Working Group on Cities of the International Resource Panel

UN-HABITAT (2013) State of the world's cities 2012/2013: Prosperity of cities. Routledge

United Nations (2011) Are we building competitive and liveable cities? Guidelines for developing eco efficient and socially inclusive urban infrastructure. Clung Wicha Press Co., Ltd, Thailand

WBCSD, World Business Council for Sustainable Development (2000). Eco-efficiency: creating more value with less impact. www.wbcsd.org/web/publications/eco_efficiency_creating_more_value.pdf. Accessed 15 May 2014

WCED (1987) Our common future. Oxford University Press, Oxford

World Bank (1996) The world urbanization prospects. United Nations, Department of Economic and Social Affairs, New York

World Bank (2014) Innovations to finance a sustainable Urban Future. http://www.worldbank.org/en/news/feature/2014/04/04/finance-innovations-for-sustainable-cities. Accessed 29 June 2014

Chapter 2
Themes in Urban Infrastructure Research in Ethiopian Cities

Abstract Chapter examines foremost types of urban infrastructure which are popularly investigated together with the cities where these investigations are executed. Review attempts to synthesize the unique characteristics of Ethiopian cities in term of their infrastructure paucity or; abundance otherwise.

Keywords Road · Energy · Storm water drainage · Sewerage · Integration · ICT · Water supply · Green infrastructure · Sanitation · Solid waste management · Social infrastructure · Health · Education · Financing · Addis ababa · Dire dawa · Bahir dar · Mekelle · Jimma · Hawassa

2.1 Introduction

Wherever you go, in Ethiopian capital Addis Ababa, construction of a solid structure could be easily seen, this is what we say infrastructure boom (BBC 2014) but the scenario is not the same across all Ethiopian cities, indeed; glitches even exists at the capital. A total of 189 different research topics concerned to urban infrastructure and services were reviewed in this study which is the subject matter of the first part of this chapter. Whilst the second part offers minutiae of 78 scrutinized Ethiopian cities, varying in size, population and location.

2.2 Major Infrastructures Themes Investigated by Researchers in Ethiopian Cities

A variety of urban infrastructure and services were considered by research investigators in Ethiopian cities; which includes specifically physical infrastructures—like road, energy, storm water drainage, water supply and sanitation, green infrastructure, solid waste management infrastructure, and ICT infrastructure and social infrastructure—mainly education and health. Apart from these; some

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research investigations were focused on organizational and governance issues such as integration of infrastructures and services, government policies on infrastructure, their challenges and solution, infrastructure for tourism, financing of infrastructure, rural–urban linkages, and infrastructure in relation to urban sprawls.

2.2.1 Road Infrastructure

Roads has a key role to play in transporting people goods physically; scholars researched, cobblestone roads which are the one indigenous material based, labour intensive, environmentally sustainable and viable infrastructure, also one of the best practices in the country adopted as a preferable mode of infrastructure provision policy specially in the interiors of the Ethiopian cities. Challenges, opportunities, employability potentials of cobblestone roads and its role in poverty alleviation are largely analysed by the scholars (Ahmednur 2009; Shewarega 2009; Mola 2010; Solomon 2010; Yeshiwas 2010; Adem 2011a, b; Assefa 2011; Kalayu 2011; Wube 2011; Haileyessus 2011).

Additionally, provision and management of road Infrastructure, its integration with other infrastructures, role in city development, performance of Ethiopian road fund in road maintenance, community participation in planning, construction, maintenance, road safety, economic role of roads, are some other issues which are considered for research (Dereje 2009; Hassen 2009; Kokebe 2009; Zemedkun 2009; Hailemichael 2010; Lemessa 2010; Negede 2010; Mesfin 2010a, b, c; Fufi 2011; Abdissa 2011; Asnake 2011; Dinkayehu 2011; Mohammedyakob 2011; Nasra 2011; Niman 2011; Said 2011; Azmeraw 2011; Zeleke 2011).

Furthermore, road Infrastructure for visually handicapped and labour-based practices like natural soil stabilization technology was among other themes of study (Samuel 2011; Wubiye 2011).

2.2.2 Energy

Cities are doubtlessly, the larger consumer of energy while the developing countries like Ethiopia are still consuming a huge amount of bio-masses for cooking purposes hence researchers attempted to evaluated socio-economic and environmental impact of improved stoves (Ahmed 2008; Wodaje 2010; Wubishet 2010). Issues of electricity were also appeared pertinent for research (Alehegne 2011).

2.2.3 Infrastructure for Urban Storm Water Management

Ethiopia cities at large, are troubled with storm water leading into floods especially during the rainy season due to inadequate installation of desired infrastructure,

problem is more critical in cities of highland regions like Addis Ababa, Adigrat; though it exist in cities with plain geographies like Bahir Dar. Scholars attempted to examine the role of integration among road and drainage infrastructure in offering solution for urban floods, while the other associated themes were; impact of urban flood on urban infrastructure, PPP in the integration of road and drainage, and impact of delayed provision of such infrastructures (Gebremariam 2008; Moges 2008; Dagnachew 2009; Kassaye 2009; Tamirat 2010; Wendale 2010; Adnan 2011; Mustefa 2011; Beniyam 2011; Birhanu 2011; Dereje 2011; Beyene 2011; Girmay 2011; Mitiku 2011; Shanbel 2011; Siraj 2011; Workineh 2011; Zamil 2011).

2.2.4 Water Supply

Importantly, water is an environmental or ecological resource and an economic good as well, despite of the fact of Ethiopia's being a water tower for African continent, because of nature's bounty in form of many lakes and rivers; sustainable urban water supply is still an issue of serious concern.

Themes, accentuated by the research investigators were: household accessibility of urban water supply, water infrastructure in new self-added residences, financing challenges and prospects of water and sanitation services, sustainability of water infrastructure, community participation, innovative options for water infrastructure strengthening, customer's satisfaction, supply and consumption, impact of urban expansion on water supply systems, factors affecting water demand and supply, operation and maintenance of water supply projects, non-revenue of water and challenges on cost recovery and water supply asset management (Meseret 2008; Ermias 2009; Tmuzghy 2009; Kinfe 2009; Teka 2010; Abdu 2010; Abera 2010; Ahmed 2010; Alemayehu 2010a, b; Desalegn 2010; Bedada 2010; Bekele 2010; Belay 2010; Berihun 2010; Birhanu 2010; Birishet 2010; Degenet 2010; Dereje 2010; Gelane 2010; Lulu 2010; Maru 2010; Mesfin 2010a, b, c; Mohammed 2010; Salim 2010; Selamawit 2010; Semeneh 2010; Tesema 2010; Abdisamad 2010; Kumulachew 2010; Aklilu 2010; Belete 2010; Tsegay 2010; Abdi 2011; Adem 2011a, b; Aden 2011; Alemu 2011; Amanuel 2011; Amsalu 2011a, b; Brhanu 2011; Getachew 2011a, b, c; Haftamu 2011; Hussien 2011; Mulugeta 2011; Mengistu 2011; Meskerem 2011; Mohammed 2011a, b; Negese 2011; Negussie 2011; Shimeri 2011; Shishay 2011; Taye 2011; Abraham 2011; Welancho 2011; Wesenseged 2011; Wointu 2011; Yesuf 2011).

2.2.5 Social Infrastructure

It was observed that the study of soft or social infrastructure in urban areas was not really popular among urban infrastructure scholars in general; though a few like

Kifle (2008) assessed the need of social infrastructure (health and education) in context of MDGs. Abiot (2009) assessed the provision, management and financing of healthcare services while the comparison between private and public provision of health amenities were also examined (Hailab 2009; Selamawit 2011; Amsalu 2011a, b; Hadra 2011; Mebruka 2011; Werede 2011; Haregua 2011; Dibera 2011; Kelifa 2011; Meseret 2011; Munir 2011; Tewfik 2011).

Financing of educational infrastructure (Tilahun 2010) assessment of educational infrastructure provision and community participation were additional issues under investigation (Abebe 2011; Adane 2011; Amine 2011; Asegedech 2011; Helen 2011; Leykun 2011; Measho 2011; Million 2011; Mulatu 2011; Rezene 2011; Seboka 2011; Teshome 2011). Role of BPR in educational infrastructure improvement was amongst the novel topic reconnoitred (Ayalneh 2011).

2.2.6 *Urban Green Infrastructure*

Urban green infrastructure was an emergent topic chosen by a limited number of research investigators (Senbeta 2009; Abdulahi 2010; Beyene 2010; Tiruset 2010; Alganesh 2011; Mechal 2011; Eyader 2011; Genet 2011; Nigussie 2011).

2.2.7 *Rural–Urban Linkages*

Sisay (2009) concentrated his study on infrastructure provision as a tool in rural–urban linkages (Sisay 2009).

2.2.8 *Urban Infrastructure for Tourism*

Additionally, a few researchers realized role of infrastructure and services in the promotion and development of tourism in Ethiopian cities (Yohannes 2009; Leul 2010; Fahmi 2010; Habtamu 2010; Mesfin 2010a, b, c; Shakir 2010; Agmas 2010; Abraha 2011; Merkebu 2011; Nestanet 2011).

2.2.9 *Urban Infrastructure for Solid Waste Management and Sanitation*

Current practices of solid waste management and sanitation in Ethiopian cities, impact of poor sanitation on human health and impact of urban growth on sanitation

were topics related to urban environmental infrastructure and services were also scanned (Herya 2010; Alazar 2011; Bedassa 2011; Merga 2011; Sisay 2011; Asnakech 2010; Fentahun 2010; Getnet 2010; Goitom 2010; Kinfe 2010; Tedelech 2010; Demelash 2010; Gebrehiwot 2010).

2.2.10 ICT Infrastructure

Issues associated with ICT infrastructure in Ethiopian cities includes: the role of ICT applications in urban local governance development, importance of mobile telephony in urban management, challenges of ICT accessibility in fostering urban socio-economic development, ICT for education infrastructure, benefits, challenges and prospects of ICT in city sector bureau and IT infrastructure provision and utilization for land administration and management (Gizaw 2010; Wogame 2010; Yimer 2011; Getacher 2011; Yeshiemebet 2011; Zena 2011).

2.2.11 Integrated Urban Infrastructure and Other Themes

Challenges and opportunities on integrated provision of urban infrastructure and services, their provision in new formal settlement and assessment of government policies were additional themes chosen by some research scholars (Michael 2009; Abiy 2010; Alemayehu 2010a, b; Asfaw 2010; Getachew 2011a, b, c; Gadet 2010; Hailekiros 2011; Moges 2011; Nigus 2011). Moreover, Maru (2011) has examined the effect of sprawling in the provision and management of urban infrastructure and services. Ethiopia is predominantly a country dependent upon agriculture and dairy-associated occupation, a researcher (Yalemzewd 2010) has attempted to examine the scenario aimed at improved infrastructure for livestock markets.

2.3 Reviewed Cities

Ethiopia is a multi-ethnic country administratively divided into two chartered city regions namely Addis Ababa (capital city of Ethiopia) and Dire Dawa and nine regional states including—Afar, Amhara, Benishangul Gumuz, Gambela, Harari, Oromia, Somali, Southern Nations Nationality People's and Tigray.

According to CSA (2007) Ethiopia has 972 urban centres though there are only 86 cities which have a population of more than twenty thousand; pace of urbanization is very fast in the country though country has a population of 73.8 million, out of which only 11.8 million are urban residents, which is merely 16 %.

This review includes 80 cities (see Table 2.1 and Fig. 2.1).

Table 2.1 Reviewed Ethiopian cities

Region/chartered city region	City
1. Addis Ababa chartered city region	Addis Ababa
2. Dire Dawa chartered city region	Dire Dawa
3. Afar region	Dubti
4. Amhara region	Arereti, Bahir Dar, Bati, Chagni, Dangila, Debark, Debre Birhan, Debre Markos, Debre Tabor, Dessie, Gondar, Injibera, Kamise, Motta, Sekota, Wereta, Woldia
5. Benishangul–Gumuz region	Assosa, Mandura
6. Gambela region	Gambela
7. Harari region	Harar
8. Oromia region	Adama, Aira, Ambo, Arsi Negelle, Bedessa, Bishoftu, Bule Hora, Burayu, Chiro, Dembi Dollo, Dhera, Gebreguracha, Gimbi, Goba, Harawacha, Holeta, Jimma, Modjo, Nedjo, Nekemte, Robe, Sebeta, Shashamane, Welenchiti, Wolliso, Yabello
9. Somali region	Jig-Jiga
10. Southern Nations Nationality People's Region-SNNPR	Aleta Wondo, Arba Minch, Bele, Bonga, Dilla, Durame, Halaba, Hawassa, Hossana, Jinka, Masha, Soyama, Tarcha, Wolaita Sodo, Wolkitte, Worabe
11. Tigray region	Abi-Adi, Adigrat, Adiremets, Alamata, Axum, Freweyne, Humera, Korem, Mekelle, Shire Endassilasie

2.3.1 Addis Ababa Chartered City Region

Addis Ababa (New flower in English) is the largest city, and one of the two chartered cities of Ethiopia which is also serving as the capital of the country. City was founded in 1886 by Emperor Menelik-II. The city is located at the elevation of 2355 m, having a population of 3.4 million (2008) and area of 527 km^2.

2.3.2 Dire Dawa Chartered City Region

Dire Dawa is the second chartered city region, located at the eastern part (9.6°N, 41.9°E) of the country on the bank of Dechatu River. City lies on the elevation of 1276 m; it has a population of 607,000 (2008), with a geographical spread of, 1.2 km^2.

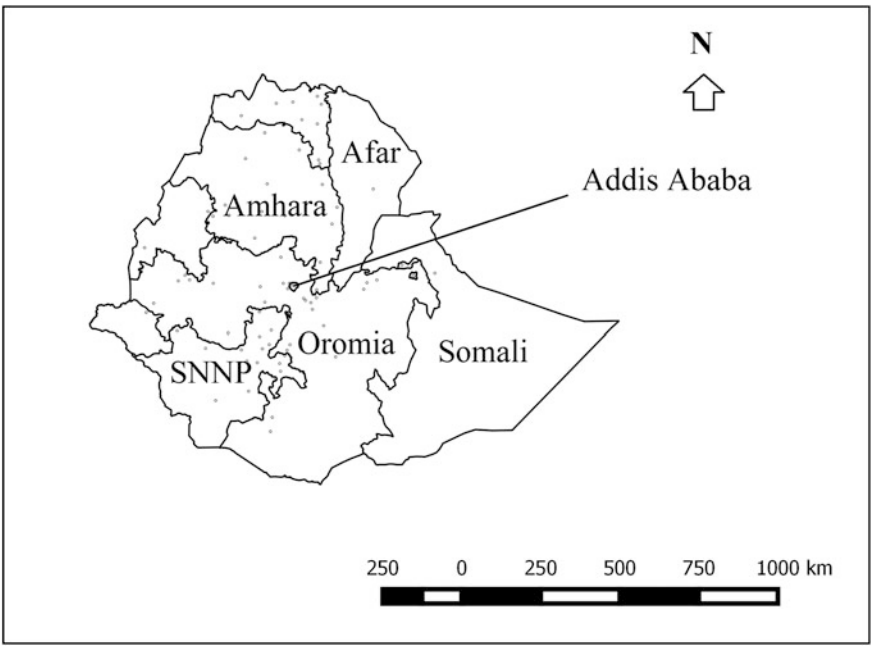

Fig. 2.1 Reviewed Ethiopian cities

2.3.3 Afar Region

Afar region is one of the emerging regions in Ethiopia and also the homeland of Afar people. Although the capital of Afar region is Samera, the town reviewed in the region is Dubti.

Dubti
Dubti is a town situated in north-eastern part of Ethiopia (11.7°N, 41.1°E) near to Awash River and Addis Ababa-Djibouti highway. The city has a total population of 16,346 (2007). The town is a level plain.

2.3.4 Amhara Region

Amhara region is home to Amhara ethnic group; it has its capital in Bahir Dar. A total of 19 towns are reviewed from this region.

Arerti
Arerti is a small town in north Shoa administrative zone, located at highland (8.9°N, 39.4°E coordinates) with a distance of 135 km east of national capital Addis Ababa and 705 km south of regional capital Bahir Dar.

Bahir Dar
Bahir Dar is the capital of Amhara region, located at 11.6°N 37.9°E coordinates. It has a population of 318,000 (2007) and an area of approximately 26 km^2. City is also known for Lake Tana (originating source of River Nile). City is a level plain with an average elevation of 1800 m.

Bati
Bati is an important market town (11.2°N and 40.1°E) in the Oromia zone of Amhara region of north-central Ethiopia. Town has an elevation of 1502 m, population of 24,000 (2007).

Chagni
Chagni is a town situated at north- western part of Ethiopia (10.9°N and 36.6°E) in Amhara region. It has an average elevation of 1583 m; and population of 30,000 (2005). The town serves as administrative capital of Guangua woreda.

Dangila
Dangila town is located at 11.2°N latitude and 36.8°E longitudes. Town has a population of 36,000 (2007). The town is surrounded by Amen and Fincha rivers, with an average elevation of 2120 m.

Debark
Debarq is the closest town of Semien Mountains National Park, located at Gondar-Axum highway (13.1°N and 37.9°E) in northern Ethiopia. It falls in Semien Gondar zone of Amhara region on the elevation of 2850 m. It has population of 21,000 (2007).

Debre Birhan
The town is located at north-eastern part of Ethiopia (9.6°N and 39.5°E), and serves as capital of North Showa zone of Amhara region. It has elevation of 2750 m and population of 95,000 (2009). The town believed to be in existence for more than six centuries.

Debre Markos
Debre Markos is situated in north-central part of Ethiopia (10.3°N and 37.7°E), in Amhara region, it comes into Gojjam zone. Town has an average elevation of 2446 m, with a population of 71,000 (2007).

Debre Tabor
Deber Tabor is found at Debub Gondar Zone, north-central Ethiopia (11.8°N and 38.1°E) in Amhara region. Town has an average altitude of 2705 m, population of 39,000 (2008) and geographical area of 6 km^2.

Dessie
Dessie is situated in north-central part of Ethiopia (11.2°N and 39.6°E), in Amhara region, it comes into Debub Wollo Zone. Town has an average elevation of 2470 m, with a population of 279,000 (2012).

Gondar
Gondar is the capital of Semien Gondar zone, north-scentral Ethiopia (12.6°N and 37.4°E) in Amhara region. Town has an average altitude of 2133 m, population of 358,000 (2008). It had privilege of being ancient Ethiopian capital.

Injibera
Injibera is a town in north-central Ethiopia, which serves as capital of Agew Awi Zone in Amhara Region. Town has a mountainous topography and average elevation of 2560 m. Population of the town was 21,000 in 2007 census.

Kamise
The town is located at north-eastern part of Ethiopia (10.5°N and 40.3°E), and serves as capital of Oromia zone of Amhara region. It has elevation of 1424 m and population of 19,000 (2007).

Motta
Motta is a town in north-central Ethiopia (11.1°N and 37.9°E), falls into Misraq Gojjam zone in Amhara Region. Town has an average elevation of 2266 m. Population of the town was 39,000 in 2007 census, spread over a geographical area of 8 km^2.

Sekota
Sekota town is located at north-eastern part of Ethiopia (12.6°N and 38.9°E), and lies at Wag Hemrazone zone of Amhara region. It has elevation of 1424 m and population of 22,000 (2007).

Wereta
Wereta is a north Ethiopian town (11.9°N and 37.7°E), located at Debub Gondar Zone of Amhara Region. It has an elevation of 1828 m and population of 13,000 in 2010.

Woldia
Woldia is a hilly market town of northern Ethiopia (11.8°N and 39.5°E), comes into Semien Wollo zone of Amhara region. It has an average altitude of 2112 m with a population of 46,000 (2007).

2.3.5 Benishangul–Gumuz Region

Benishangul–Gumuz, region is home of Berta or Benishangul and Gumuz ethnic groups; spread over western part of the country. Capital of the region is Assosa. A total of 2 towns were reviewed in the study including the regional capital Assosa and Mandura.

Assosa
Asosa is the capital of Benishangul–Gumuz, region located at western part of Ethiopia (10°N and 34.4°E). The town has an elevation of 1570 m with a flatland topographical features. The population of the city was 22,000 in 2007.

Mandura
Mandura is a west Ethiopian town (11°N and 36°E), lies into Metekel zone of the Benishangul–Gumuz region. It has an elevation of 2331 m and population of 7000 (2009).

2.3.6 Gambela Region

Gambela region is home of Gambela ethnic group and situated in the western part of Ethiopia amid Baro and Akobo Rivers. Gambela is the only town reviewed from the region.

Gambela
Gambela town serves as regional capital of Gambela. The city has its location at 8.5°N and 34.6°E coordinates. It comprises flatland topography with an average altitude of 526 m; the city population was 39,000 in 2007.

2.3.7 Harari Region

Harari region is motherland of Harari ethnic group; it is the smallest region of the country located at western part. Harar is the capital of the region and also the only town included in the current review.

Harar
The town of Harar serves as the capital of Harari region; it has a hilltop positioned on the eastern arm of Ethiopian highlands. It is a fortified town, accredited by UNESCO as world heritage site. The city is located at 89.5°N and 41.9°E coordinates. It has an average altitude of 1885 m and population estimated 152,000 (2012).

2.3.8 Oromia Region

Oromia is the largest region of Ethiopia in term of geographical area; it is a highland and native place of Oromo ethnic group. At present its functional capital is in Addis Ababa. Total 26 towns are considered for review from this region.

Adama
Adama (Nazreth) is the former capital of the Oromia region located at central part of Ethiopia (8.54°N 39.27°E). City has an average elevation of 1712 m and population of 300,000. Close to the national capital, Adama is a busy transport town.

Aira
Aira (Ayira) is a central Ethiopian town (9.1°N and 35.3°E), lies into western wollega zone of the Oromia region. It has an elevation of 1600 m and population of 20,000 (2010).

Ambo
Ambo is a central Ethiopian town (11.98.9°N and 38.2°E), located at west shewa zone of Oromia Region. It has an elevation of 2101 m and population of 94,000 in 2012.

Arsi Negelle
Arsi Negelle town is located at south-eastern part of Ethiopia (7.2°N and 38.9°E), and lies at mirab arsi zone of Oromia region. It has an elevation of 2043 m and population of 62,000 (2010).

Bedessa
Bedessa is an eastern Ethiopian town (8.9°N and 40.6°E), lies into western hararghe zone of the Oromia region. It has an elevation of 1761 m and population of 18,000 (2007).

Bishoftu
Bishoftu (Debrazait) is a tourist attraction close to Addis Ababa, located at central part of Ethiopia (8.7°N and 38.9°E) in Misraq Shewa zone of Oromia region. It has an elevation of 1920 m and population of 171,000 (2012).

Bule Hora
Bule Hora is a southern Ethiopian town (5.6°N and 38.2°E), lies into borena zone of the Oromia region. It has an elevation of 1825 m and population of 39,000 (2010).

Burayu
Burayu is a town adjacent to Addis Ababa, located at central part of Ethiopia (9°N and 38.69°E) in Oromia special zone of Oromia region. It has an elevation of 1920 m and population of 171,000 (2012).

Chiro
Chiro is an eastern Ethiopian town (9°N and 40.9°E), serves as capital of West hararghe zone of the Oromia region. It has an elevation of 1826 m and population of 57,000 (2014).

Dembi Dollo
Dembi dollo is a prominent market town of southwestern Ethiopia (8.5°N and 34.7°E). It serves as the capital of Kelem Welega Zone of the Oromia Region. This town has an elevation of 1701 m and holds a population of 29,000 (2007).

Dhera
Dhera is a south-eastern Ethiopian town (8.3°N and 39.3°E) found in the Arsi Zone of the Oromia Region. It has an average altitude of 1700 m and comprises 9000 people in 2007.

Gebreguracha
Gebreguracha is a central Ethiopian town (9.7°N and 38.5°E). It is located in north shewa zone of the Oromia Region. This town has an elevation of 2545 m and holds a population of 23,000 (2007).

Gimbi
Gimbi is a town in western Ethiopia (9.2°N and 35.8°E) found in the west welega zone of the Oromia Region. It has an average altitude of 1845 m and comprises 31,000 people in 2007.

Goba
Goba is a south-central Ethiopian town (7°N and 39.9°E). It is located in bale zone of the Oromia Region. This town has an elevation of 2743 m and holds a population of 33,000 (2007).

Harawacha
Harawacha is a town in eastern Ethiopia (9.4°N and 42.9°E) found in the west hararghe zone of the Oromia Region. It has an average altitude of 1900 m and comprises 21,000 people in 2007.

Holeta
Holeta is a town close to Addis Ababa, located at central part of Ethiopia (9°N and 38.5°E) in Oromia special zone of Oromia region. It has an elevation of 2391 m and population of 25,000 (2007).

Jimma
Jimma is a south-western Ethiopian town (7.8°N and 36.9°E). It is located in jimma special zone of the Oromia Region. This town has an elevation of 1780 m and holds a population of 207,000 (2012).

Modjo
Modjo is a town in central Ethiopia (8.7°N and 39.1°E) found in misraq shewa zone of the Oromia Region on the bank of Modjo River. It has an average altitude of 1788 m and comprises 49,000 people in 2008.

Nedjo
Nedjo is a western Ethiopian town (9.5°N and 35.5°E). It is located in west wollega zone of the Oromia Region. This town has an elevation of 1821 m and holds a population of 25,000 (2012).

Nekemte
Nekemte is a town in western Ethiopia (9.1°N and 36.5°E) found in east welega zone of the Oromia Region. It has an average altitude of 2088 m and comprises 111,000 people in 2012.

Robe
Robe or Bale-Robe is a southern-central Ethiopian town (7.1°N and 40°E). It is located in bale zone of the Oromia Region. This town has an elevation of 2492 m and holds a population of 44,000 (2007).

Sebeta
Sebeta is a town in central Ethiopia (8.9°N and 38.6°E) found in Oromia special zone of the Oromia Region. It has an average altitude of 2356 m and comprises 49,000 people in 2007.

Shashamane
Shashamane is a southern-central Ethiopian town (7.2°N and 38.6°E). It is located in west-arsi zone of the Oromia Region. This town has an elevation of 1933 m and holds a population of 122,000 (2012).

Welenchiti
Welenchiti is a town in east-central Ethiopia (8.8°N and 39.5°E) found in misraq (east) shewa zone of the Oromia Region. It has an average altitude of 1436 m and comprises 15,000 people in 2007.

Wolliso
Wolliso is a southern-western Ethiopian town (8.5°N and 37.9°E). It is located in debub mirab shewa zone of the Oromia Region. This town has an elevation of 2063 m and holds a population of 38,000 (2007).

Yabello
Yabello is a town in southern Ethiopia (4.9°N and 38.9°E) found in borena zone of the Oromia Region. It has an average altitude of 1857 m and comprises 18,000 people in 2007.

2.3.9 Somali Region

Somali region is one of the emergent regions of Ethiopia, expanded along with eastern boundary of the country. It is homeland of Somali tribe. Jig-Jiga is the capital and only reviewed city from the region.

Jig-Jiga
Jig-Jiga is a town in western Ethiopia (9.3°N and 42.8°E), also serves as the capital of Somali region and found in Jig-Jiga zone. It has an average altitude of 1609 m and comprises 2,000,000 people in 2012.

2.3.10 SNNP Region

Southern Nations, Nationalities,and Peoples' region or SNNP region is located at the southern part of country having low elevation and full of green and most fertile

areas. A total of 16 towns were reviewed from this region. Region has its capital in Hawassa.

Aleta Wondo
Aleta Wondo is a town in southern Ethiopia (6.6°N and 38.40°E) found in sidama zone of the SNNP region. It has an average altitude of 2037 m and comprises 23,000 people in 2007.

Arba Minch
Arba Minch is a southern Ethiopian town (8.5°N and 37.9°E). It is located in gamo gofa zone of the SNNP region. This town has an elevation of 1285 m and holds a population of 95,000 (2012).

Bele
Bele is a town in southern Ethiopia (7°N and 37°E) found in wolaita zone of the SNNP region. It has an average altitude of 1500 m and comprises 7000 people in 2007.

Bonga
Bonga is a southern Ethiopian town (7.3°N and 36.3°E). It is located in keffa zone of the SNNP region. This town has an elevation of 1714 m and holds a population of 21,000 (2007).

Dilla
Dilla is a town in southern Ethiopia (6.4°N and 38.3°E) found in gedeo zone of the SNNP region. It has an average altitude of 1570 m and comprises 80,000 people in 2012.

Durame
Durame is a southern Ethiopian town (7.25°N and 37.9°E). It is located in kembata tembaro zone of the SNNP region. This town has an elevation of 2101 m and holds a population of 25,000 (2007).

Halaba
Halaba or Alaba Kulito is a town in southern Ethiopia (7.3°N and 38.1°E) found in kembata tembaro zone of the SNNP region. It has an average altitude of 1726 m and comprises 27,000 people in 2007.

Hawassa
Hawassa is a southern Ethiopian town (7°N and 38.5°E). It serves as the capital of SNNP region; and falls in Hawassa special zone of the SNNP region. This town has an elevation of 1708 m and holds a population of 165,000 (2012).

Hossana
Hosanna is a town in southern Ethiopia (7.5°N and 37.9°E) and capital of hadiya zone of the SNNP region. It has an average altitude of 2177 m and comprises 76,000 people in 2012.

Jinka
Jinka is a southern Ethiopian town (5.8°N and 36.5°E). It is located in debub omo zone of the SNNP region. This town has an elevation of 1490 m and holds a population of 32,000 (2007).

Masha
Masha is a town in southern Ethiopia (7.7°N and 35.5°E) and capital of keficho shekicho zone of the SNNP region. It has an average altitude of 2223 m and comprises 14,000 people in 2007.

Soyama
Soyama is a southern Ethiopian town (5.8°N and 36.5°E). It is the capital of burji special woreda of the SNNP region. This town has an elevation of 1660 m and holds a population of 10,000 (2007).

Tarcha
Tarcha is a town in southern Ethiopia (7.1°N and 37.1°E) and capital of dawuro zone of the SNNP region. It has an average altitude of 1710 m and comprises 25,000 people in 2007.

Wolaita Sodo
Wolaita Sodo is a southern Ethiopian town (6.9°N and 37.8°E). It is the capital of sodo zone of the SNNP region. This town has an elevation of 1600 m and holds a population of 86,000 (2012).

Wolkitte
Wolkite is a town in southern Ethiopia (8.3°N and 37.8°E) and capital of gurage zone of the SNNP region. It has an average altitude of 1910 m and comprises 29,000 people in 2007.

Worabe
Worabe is a southern Ethiopian town (6.9°N and 37.8°E). It falls in gurage zone of the SNNP region. This town has an elevation of 2113 m and holds a population of 19,000 (2010).

2.3.11 Tigray Region

Tigray Region is located at the northern border of Ethiopia. It is the native place of Tigray ethnic group. The region has its capital in Mekelle. A total of 10 towns are reviewed from the region.

Abi-Adi
Abi-Adi is a northern Ethiopian town (13.6°N and 39°E). It is found in me-hakelegnaw zone of the Tigray region. This town has an elevation of 2275 m and holds a population of 16,000 (2007).

Adigrat
Adigrat is a town in northern part of Ethiopia (14.3°N and 39.5°E) and found in the misraqawi zone of the Tigray region. It has an average altitude of 2457 m and comprises 76,000 people in 2013.

Adiremets
Adiremets or Addi Remets is a northern Ethiopian town (13.8°N and 37.3°E). It is found in miirabawi (western) zone of the Tigray region. This town has an elevation of 1870 m and holds a population of 5000 (2007).

Alamata
Alamata is a town in northern part of Ethiopia (12.4°N and 39.5°E) and found in the debubawi (southern) zone of the Tigray region. It has an average altitude of 1520 m and comprises 33,000 people in 2007.

Axum
Axum is a northern Ethiopian town (12.4°N and 39.5°E) having a greater importance because of its rich heritage and tourist attraction. It is found in debubawi (southern) zone of the Tigray region. This town has an elevation of 1520 m and holds a population of 33,000 (2007).

Freweyne
Freweyne is a town in northern part of Ethiopia (14.5°N and 39.5°E) and found in the misraqawi zone of the Tigray region. It has an average altitude of 2480 m and comprises 11,000 people in 2010.

Humera
Humera is a northern Ethiopian town (14.3°N and 36.6°E) of strategic significance. It is found in miirabawi (western) zone of the Tigray region. This town has an elevation of 602 m and holds a population of 22,000 (2007).

Korem
Korem is a town in northern part of Ethiopia (12.5°N and 39.5°E) and found in the debubawi (southern) zone of the Tigray region. It has an average altitude of 2539 m and comprises 19,000 people in 2007.

Mekelle
Mekelle is a northern Ethiopian town (13.5°N and 39.5°E). It serves as the capital of Tigray region and lies in debubawi (Southern) zone. This town has an elevation of 2084 m and holds a population of 220,000 (2012).

Shire Endassilasie
Shire Endassilasie is a town in northern part of Ethiopia (14.1°N and 38.3°E) and found in the semien miirabawi (north-western) zone of the Tigray region. It has an average altitude of 1953 m and comprises 47,000 people in 2007.

2.4 Conclusion

Ethiopia is a developing country actively combating with the challenges on urban infrastructure and service provision. It was observed, that scholars found a number of topics appealing and research worthy from water supply to ICT infrastructure. Additionally, the ethnic diversity and variation on geographies probably makes above challenges more multifaceted which calls for specific solutions for each urban settlement indeed.

References

Abdi K (2011) Constraints and prospects of water supply infrastructure and services delivery in Aira town, Oromia Region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdisamad O (2010) Study of challenges in managing urban water supply infrastructure in Jig-Jiga Town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdissa D (2011) An assessment of road infrastructure provision and management in Asella Town, Oromia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdu M (2010) Assessment of water supply in afar national regional state: the case of Dubti town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdulahi M (2010) An assessment of the situation of urban green infrastructure provision in Goba Town, Oromia Region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abebe K (2011) An assessment of educational infrastructure provision in government first cycle secondary schools-the case in Yeka sub-city, Addis Ababa. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abera B (2010) An assessment of domestic water supply and service in the case of Akaki Kaliti sub city of Addis Ababa City Administration. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abiot T (2009) Assessment of healthcare infrastructure provision and management in medium sized cities of ET: the case of Hawassa City. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abiy H (2010) Challenges and prospects of integrated infrastructure provision and management-the case of Bahir Dar City. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abraha K (2011) The contribution of infrastructure provision to tourism development: a case study of Addis Ababa City. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abraham T (2011) Assessment of water supply infrastructure and service delivery in Nedjo Town, Oromia Region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Adane G (2011) Assessment of educational infrastructure and service provision in Debre Tabor town: Amhara regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Adem A (2011a) Cobblestone pavement as an alternative in the road infrastructure provision and its contributions in reducing unemployment, a case study of Adama city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Adem A (2011b) Challenges, prospects of water supply infrastructure provision and is service deliver in Debre-Tabor town—Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Aden H (2011) Assessment of water supply infrastructure and service provision in Soyama town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Adnan A (2011) An assessment of the provision of urban drainage infrastructure in Wolkitte town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Agmas T (2010) towards improved tourism infrastructure in Debark town and its environs. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ahmed E (2010) An assessment of water supply infrastructure and service delivery in Dessie town, Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ahmed MA (2008) An assessment of environmental and socio-economic impacts of improved stoves. The case of 'Mirt' in Woldia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ahmednur M (2009) Challenges and opportunities of cobblestone road infrastructure projects in Dire Dawa. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Aklilu H (2010) Analysis of water supply infrastructure in Dilla town: Gedeo Zone, SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alazar SB (2011) Assessment of the effect of inadequate sanitation infrastructure and service provision on human health in the case of Bahir Dar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alehegne A (2011) An assessment of electric power infrastructure and services in Motta town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alemayehu B (2010a) Assessment of water supply infrastructure provision and service—the case of Woliata Sodo town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alemayehu GMA (2010b) Challenges and prospects for integrated infrastructure provision and management in tertiary towns of ET: a case of Dembi Dollo town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alemu A (2011) An assessment of water supply infrastructure provision and service delivery-the case of Humera town, Tigray. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alganesh AT (2011) Problems and prospects in the provision and management of green infrastructure; the case of Mekele city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amanuel TB (2011) An assessment of water supply in-frastructure and service delivery in Nekemte city administration, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amine D (2011) Analysis of educational infrastructure provision and services in Adigrat town, Tigray region, Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amsalu AA (2011a) An assessment of public healthcare infra-structure and service delivery in Bahir Dar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amsalu TA (2011b) Impact of urban growth on water supply infrastructure and its provision: the case of Burayu town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Asegedech ZB (2011) Assessment of education infrastructure and service provision in Debre Berhan town Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Asfaw TM (2010) An assessment of water supply and service delivery in Gondar town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Asnake Y (2011) An assessment of operation and maintenance of road infrastructure in Bahir Dar city, Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Asnakech KF (2010) Assessment of solis waste infrastructure management: a case of Nekemte town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Assefa KA (2011) Opportunities and challenges of the labor intensive constructions (cobblestone) in Addis Ababa. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ayalneh K (2011) Assessment of business process re- engineering in improving the efficiency of educational infrastructure and service delivery (In Kamise town). Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Azmeraw MZ (2011) An assessment of the economic role of road infrastructure in Bahir Dar city Administration. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

BBC (2014) Ethiopia's property and infrastructure boom. http://www.bbc.com/news/business-30144471. Accessed 20 June 2015

Bedada AD (2010) Water supply infrastructure and service de-livery in Gebreguracha town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Bedassa RS (2011) Effect of inadequate sanitation infrastructure on human health in Chiro town, Oromia regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Bekele AA (2010) Assessment of household water supply and sanitation service in Bahir Dar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Belay GJ (2010) Innovative options for strengthening water supply infrastructure management and service delivery in Nekemte city administration. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Belete A (2010) Analysis of water supply infrastructure management in Jinka town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Beniyam FK (2011) An assessment of challenges and prospects of storm water drainage infrastructure management in Kemessie town-Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Berihun YD (2010) Challenges and prospects of water supply infrastructure and service delivery-the case of Woldia town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Beyene FH (2011) Analysis of causes and effects of delay in road and drainage construction projects in Dessie city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Beyene G (2010) An assessment of urban green infrastructure provision and management: the case of Arsi Negelle town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Birhanu DG (2011) Potentials of public private partnerships in integrated road and drainage infrastructure provision—the case of Bishoftu town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Birhanu E (2010) Challenges of urban water supply and service provision: the case of Dilla town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Birishet GA (2010) Assessment of water supply and service (the case of Shire Endassilasie town, Tigray region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Brhanu KA (2011) An assessment of water supply infrastructure and service delivery-in the case of Sekota town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

CSA (2007) Population and housing census report-country—2007, Central Statistical Agency, 2010–07. http://www.csa.gov.et/index.php/2013-02-20-14-51-51/2013-04-01-11-53-00/census-2007. Accessed 21 June 2015

Dagnachew A (2009) An assessment of the integration between road and urban storm water drainage net-work in Addis Ababa: Addis Ketema sub-city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Degenet HD (2010).The status of water supply systems and service provision in Durame town (SNNPR). Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Demelash D (2010) Analysis of challenges in managing municipal solid waste infrastructure in Wolaita Sodo town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dereje B (2010) An assessment of customer satisfaction on srvice provision and management of water supply in Ambo town of Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dereje G (2009) Impacts and opportunities of integrated infrastructure provision and management in Addis Ababa—the case of road and road related infrastructure. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dereje MC (2011) The challenges of urban drainage infrastructure—the case of Chiro town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Desalegn FE (2010) Assessment of water supply infrastrcture and service delivery in Gimbi town-Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dibera FS (2011) Healthcare infrastructure provision and service delivery in case of Gimbi town, Oromia region, Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dinkayehu B (2011) An assessment of factors affecting road safety the case of Hawassa city, SNNPR, Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ermias DB (2009) Water infrastructure provision for new self aided resedential housing development cooperatives project site in Akaki Kality subcity. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Eyader A (2011) An assessment of green infrastructure provision and management in Assossa town, Benishangul Gumuz region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Fahmi M (2010) An assessment on impact of infrastracture provision on tourism development in Harari region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Fentahun WA (2010) The effectiveness of dream light project on solid waste management infrastructure. The case of Bahir-Dar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Fufi DD (2011) An assessment of provision and maintenance of road infrastructure and its role on urban development of Gimbi town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gadet TD (2010) Municipal services in Gambella town: challenges and solutions. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gebrehiwot G (2010) An assessment of solid waste infrastructure management; a case of Alamata town administration. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gebremariam H (2008) Road and drainage infrastructure as panacea for flood management in Adigrat city, Tigray regional state of Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gelane TW (2010) A thesis on an assessment of water supply provision in Robe town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Genet A (2011) A study on green infrastructure management: challenges and opportunities in Arada sub-city, Addis Ababa city administration. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getacher G (2011) Assessment of the role of ICT infrastructure and service for the development of education in Kolfe Keranio sub city, Addis Ababa. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getachew G (2011a) Operation and maintenance of water supply infrastructure system in Dangila town, Amhara national regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getachew NT (2011b) Assessment of challenge and prospects of integrated infrastructure provision and management in Sebeta town-Oromia regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getachew T (2011c) The challenges and opportunities of financing water supply infrastructure in Debre Markos town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getnet AB (2010) An assessment of solid waste management infrastructure in Dessie city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Girmay Z (2011) An evaluation of drainage infrastructure for storm water management in Alamata town-Tigray region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gizaw SW (2010) Evaluation of ICT applications in urban local governance development-The case of Hawassa city SNNPR state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Goitam T (2010) An assessment of solid waste management system in Setit Humera town, Tigray region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Habtamu S (2010) Challenges and opportunities of tourism development in Bahir Dar city, Amhara regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hadra H (2011) Health care infrastructure financing in Dubti town—Afar region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Haftamu BG (2011) An assessment of water supply and sanitation infrastructure provision and management: the case of Freweyne town, Tigray regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hailab W (2009) An assessment of healthcare infrastrcture and service provision in Dire Dawa city. Unpublished master's thesis. Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hailekiros T (2011) Integrated infrastructure provision for new formal residential settlement-the case of Mekelle city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hailemichael WS (2010) An assessment of community participation in the planning construction and maintenance of Urban Road Infrastructure-the case of Mekelle city Tigray region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Haileyessus E (2011) An assessment of road infrastructure in Dilla town, SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Haregua B (2011) An assessment of healthcare infrastrcture and service delivery in Bahir Dar City-Amhara national regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hassen G (2009) The impact of road infrastructure on the development of Shashemene city: Oromia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Helen D (2011) Evaluation of secondary education infrastructure and service provision in Bonga town (SNNPR). Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Herya M (2010) Impact of poor sanitation infrastructure on human health in Harar town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hussien B (2011) An assessment of factors affecting water supply in Adama City-Oromia region, Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kalayu FD (2011) The role of road infrastructure provision on urban development in Axum town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kassaye AB (2009) Assessment of storm water drainage infrastructure in Gimbi town: Oromia region, West Wollega Zone. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kelifa A (2011) The role of urban actors in health care service delivery of Worabe town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kifle B (2008) Millennium development goals based social infra-structure and service provision need assessment of et: the case of Jimma city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kinfe B (2010) On assessment of solid waste management and service provision the case of Assosa town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kinfe G (2009) Household water supply infrastructure accessibility in Mekelle city, Tigrai region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kokebe Y (2009) A study on the assessment of road infrastructure provision and management in Adama city, Oromia national regional state of Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kumulachew DG (2010) An assessment of factor affecting pipe water demand and supply-the case of Masha town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Lemessa E (2010) An assessment of road infrastructure and its implications on urban development in Assosa town, Benishangul Gumuz region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Leul N (2010) Impact of infrastructure provision on tourism development at Axum town, Tigray. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Leykun BT (2011) Assessment of educational infrastructure and service provision in Adiremets town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Lulu GA (2010) Factors determining household water supply and consumption level in Addis Ababa: the case of Bole sub-city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Maru L (2010) An assessment of water supply and sanitation service in AA, case of Yeka sub city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Maru OE (2011) Assessment of urban sprawl effects on infrastructure provision and management-the case of Chagni town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Measho TT (2011) An assessment of community participation in educational infrastructure planning and service delivery: the case of Shire-Indaslassie town, Tigray regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mebruka M (2011) Financing healthcare infrastrcture in Bedessa town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mechal MZ (2011) Assessment of green infrastructure provision and it's management in Kamise town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mengistu BO (2011) Impacts of urban horizontal expansion on drinking water supply and its service delivery in Sebata town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Merga T (2011) An assessment of the impact of urban growth on sanitation infrastructure and services delivery in case of Ghimbi town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Merkebu L (2011) Assessment of the impact of tourism infra-structure on city's development a case of Bahir Dar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Meseret A (2011) The impact of infrastructure provision and management on health care service delivery: the case of Durame town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Meseret A (2008) Analysis of household water accessibility in Dessie town of Amhara regional state, Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mesfin A (2010a) Impacts of urban expansion on water supply system in Adigrat town, Tigray regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mesfin H (2010b) An assessment of the integration among road and utility infrastructures in AA: the case of Kirkos sub-city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mesfin N (2010c) Infrastructure provision and management for tourism industry development in Korem town and its Fringe area, Tigray regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Meskerem BB (2011) Challenges in water supply infrastructure provision and service management in Bule Hora town administration Oromia region, Ethiopia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Michael HB (2009) Challenges and prospects of integrated infrastructure provision and management in Adigrat-Tigary. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Millon SB (2011) Assessment of community participation in educational infrastructure service provision and management in primary schools of Arerti town, Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mitiku NM (2011) Challenges and prospects in road and drainage infrastructure provision and management the case of Gimbi town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Moges BM (2011) Assessment of government urban policy in relation with integrated urban physical infrastructure provision and services—the case of Bahir Dar city, Amhara national regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Moges SGM (2008) Towards an integrated road and storm water drainage infrastructure development in Bahir Dar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammed E (2010) An Assessment of water supply infrastructure and service in Bati town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammed A (2011a) Challenges towards water supply infrastructure provision and service delivery in Harawacha town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammed OB (2011b) Assessment of community participation in water supply infrastructure management in Jig-Jiga town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammedyakob KA (2011) Assessment of the road infrastructure provision and management in Robe town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mola A (2010) Strategic assessment of achievements and challenges in the implementation of cobblestone roads construction in Hossana town, SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mulatu DA (2011) The role of community participation in provision and management of educational infrastructure and service delivery in Holeta town, Oromia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mulugeta LA (2011) Management of water supply infrastructure operation and maintenance in Shashemene town, Oromia region: a situational analysis. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Munir AY (2011) An assessment of health infrastructure and service delivery-the case of Harar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mustefa EA (2011) Assessment of drainage infrastructure provision and management the case of Worabe town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Nasra S (2011) An assessment of challenges and opportunities for cobblestone road infrastructure projects in Mekelle City-Tigray region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Negede S (2010) Strategic evaluation of community participation on access roads and sewerage patterns-the case of Addis Ketema sub-city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Negese LM (2011) Assessing the challenges for sustainable water supply services delivery in Asella town-Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Negussie DB (2011) An assessment of water supply and customer satisfaction in Wolliso town, Oromia. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Nestanet G (2011) Infrastructure provision for tourism development in Bishoftu town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Nigus T (2011) Assessment of Ethiopian urban development policy. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Nigussie A (2011) Title of thesis: assessment of green infrastructure and its management in Yabello town of Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Niman ME (2011) The impact of road infrastructure provision on urban economic development-the case of Jig-Jiga town, Somali regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Rezene M (2011) Analysis of provision and management of educational infrastructure and facilities in government primary school, the case of Arada sub-city, Addis Ababa. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Said M (2011) An assessment of road infrastructure provision and management in Dire Dawa city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Salim B (2010) Strategic assessment of the challenges and potentials of household water supply infrastructure provision and service delivery in Halaba town, SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Samuel D (2011) Road infrastructure provision for visually handicapped: the case study of Hawassa city SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Seboka HG (2011) The demand for primary education infrastructure and its provision the case of Asella town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Selamawit BG (2011) The status of health care infrastructure and health care service delivery in Oromia region: the case of Gerbaguracha Town, Oromia Region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Selamawit T (2010) An assessment of water supply infrastructure and service in Hossana town, SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Semeneh A (2010) Assessment of urban water supply services in Mandura town, Benishangul Gumuz regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Senbeta A (2009) Evaluation of urban green infrastructure: the case of Nekemte town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shakir AY (2010) The role of integrated infrastructure provision in tourism development a case of Harar town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shanbel WA (2011) Importance of drainage infrastructure in flood management the case of Welenchiti town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shewarega S (2009) Challenges and opportunities for cobblestone road construction in the provision of infrastructure and poverty reduction in Hawassa city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shimeri M (2011) Assessment of challenges and service delivery of water supply in Burayu town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shishay M (2011) An assessment of water supply and service delivery a case study in Mekelle Quiha sub city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Siraj MJ (2011) An assessment of urban drainage infrastructure and flood management, Abi-Adi town, Tigray region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Sisay A (2009) Infrastructure provision as a tool in rural—urban linkages: a case of Modjo and Lume area. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Sisay AM (2011) Assessment of water supply and sanitation service provision Wegeda town, South Gonder, Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Solomon L (2010) An assessment of the application of labour-based construction: the case of Addis Ababa city Cobblestone project. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tadelech AB (2010) An assessment of solid waste infrastructure management the case of Hosanna town, SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tamirat TM (2010) An assessment of urban flood management on infrastructure in Shashamane city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Taye MG (2011) Assessment of non-revenue water and cost recovery on urban water supply in case of Dessie city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Teka AA (2010) An assessment of community participation for sustainability of water supply infrastructure project: the case of Chira town of Oromia national regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tesema KA (2010) An assessment of water supply infrastructure and service provision in case of Aleta Wondo town, SNNPR. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Teshome H (2011) Assessing the provision and management of educational infrastructures and services in Bele town, SNNPRS. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tewfik AA (2011) Analysis of public health infrastructure provision and management (the case of Jugal Hospital in Harar city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tilahun AA (2010) An assessment of the financing of urban educational infrastructure in two primary and secondary schools, in case of Haik city administration. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tiruset K (2010) Challenges and opportunities for green infrastructure provision in Debre Markos town, Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tmuzghy BF (2009) Challenges and prospects of financing urban water supply and sanitation infrastructure in Addis Ababa city administration. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tsegay K (2010) An assessment of water supply and service provision in Alamata town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Welancho WG (2011) Urban water management is a panacea for urban water crisis: case of Tarcha town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wendale AA (2010) An assessment of the provision and management practice of drainage infrastructure for flood management the case of Dangila town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Werede E (2011) Comparative analysis of health care infrastructure provision and service delivery between Government and Private Hospitals in Mekelle city administration, Tigray regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wesenseged B (2011) Challenges and opportunities of financing water supply infrastructure in Mekelle city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wodaje M (2010) An assessment of alternative urban energy infrastructure: the case of biomass cooking stoves in Debre Markos town (with special reference to 'Mirt' improved stove) Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wogame P (2010) An evaluation of mobile phone adoption and its uses in urban management: the case of Hosanna town, Southern Nations Nationalities and People Region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wointu H (2011) Assessing the challenges of water supply infrastructure asset management in Addis Ababa water and sewerage authority. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Workineh YB (2011) An assessment of drainage infra-structure provision and management in Injibara town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wube LF (2011) The effects of cobblestone road project on employment creation in Arba Minch city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wubishet TK (2010) The role of biogas energy infrastructure provision in Hawassa city for saving non-renewable energy resources. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wubiye MJ (2011) Assessment of labour—based practices in natural soil stabilization technology. The case of AA city roads construction. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yalemzewd T (2010) Towards improved livestock market infra-structure in AA City and Butajira Town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yeshiemebet AT (2011) Benefits challenges and prospects of information and communication technology ICT in Addis Ababa city sector Beauros. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yeshiwas YT (2010) Assessment of labor-intensive infrastructure construction technologies in Bahir Dar city: a case of Cobblestone road construction project. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yesuf H (2011) An assessment of water supply and service delivery in Dhera town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yimer G (2011) Challenges of ICT accessibility in fostering socio-economic development-in case of Woldia town administration, Amhara region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yohannes TG (2009) Infrastructure provision for tourism industry development in Dire Dawa. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zamil A (2011) An Assessment of the provision and management of storm water drainage infrastructure in the city of Harar. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zeleke AW (2011) An assessment of road infrastructure provision and management in Bishoftu town, Oromia region. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zemedkun A (2009) An assessment of road infrastructure and service provision in Dire Dawa city. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zena KM (2011) The assessment of IT infrastructure provision and utilization for land administration and management in Bole sub-city, Addis Ababa. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Chapter 3
An Appraisal on Literature Review

Abstract Literature referred and utilized by the research investigators are valued in this chapter. As the urban infrastructure domain covers range of academic and professional disciplines, it warrants a comprehensive consultation of literature from local to global levels and also from unpublished sources to pervasive sources to lay a sound understanding of the challenges and the multifarious characteristics of urban infrastructure issues.

Keywords Literature review · Theoretical context · Articulating general idea · Formulation of hypotheses

3.1 Introduction

Review of literature formulates not only the prelude of any research investigation though it also espouses the entire research design at various stages.

It has two main objectives:

- It helps researcher in order to select an explicit problem for inquiry and in constructing the theoretical context for the whole research; and
- It also contributes in the articulation of the general suppositions about the issues or variables involved in the problem and developing the single or multiple hypotheses at later stage.

Apart from the above, literature review also shows the understanding of the investigator, concerned to the thematic areas under investigation, and consequently his efficiency to accomplish the research (Kothari 2004).

The review of literature executed for urban infrastructure research in Ethiopian cities is showcased later in the chapter on three major selected themes:

i. Urban energy efficiency,
ii. Integrated provision of roads and drainage for urban storm water management, and
iii. Urban water supply.

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3.2 Urban Energy Efficiency Scenario

A research investigation made on improved efficiencies in biomass consumption in the urban areas of Ethiopia, for fulfilling energy requirements of local people, attempted to review a variety of literature, such as reports from the global agencies to the national- and local-level relevant published and unpublished works aimed at the environmental and socio-economic consequences of fuel wood consumption.

Ahmed (2008) rightly observed that inefficient consumption of the biomasses is the root cause for the environmental degradation and increasing temperature in the city surroundings, decline in ambient air quality through pollutants (Rajagopal and Zilberman 2007; Smith 1994; Ahuja 1990), while it is highly relevant for the livelihood and subsistence for many (Hailelul 2002).

The time consumed by women in fuelwood collection affects their other productive and leisure activities (ESMAP 1991), while burning of fuelwood produces indoor air pollution and causes millions of death at global level and also increases various types of respiratory diseases including prevailing bronchitis, low birth rates and increased infant mortality (Cetinkaya et al. 2000; Station and Harding 2002).

Some of reviewed literature fit into the studies carried out in developing countries like India, Philippines, Turkey and Ethiopia.

Reviewed literature also prompts for attaining insights and problem-solving strategies such as adoption of improved stoves (Douglas et al. 1994).

Evolution process of improved stoves was started at its manufacturing from mud without chimney with lesser energy efficiency (Kammen 1995; Ergeneman 2003) and later improved stoves with chimney were developed (Sinha 2002).

Additionally, researcher observed that despite of its potential improved stoves are still less popular in many Ethiopian cities, where people still rely on biomass for cooking the traditional food.

3.3 Integrated Provision of Roads and Drainage for Urban Storm Water Management

From the literature, Gebremariam (2008) noted that natural drainage and water cycle is interrupted by human activities on the urban landscape, and man-made hard pavements allowed rainwater to runoff, rather than soak it into groundwater storage. It has resulted urban floods, leading to loss of lives, property damage, stagnant water (favourable place for mosquito breeding leading to epidemics like malaria and dengue), communication interruptions and loss of livelihoods (Basak 1999; Douglas and Alam 2006).

From various global experiences, urban floods could be managed or mitigated through adequate grey infrastructure provision including proper drainage along with roads (preferably in both sides), sustainable handling of wastewater and storm water through separate handling, and reducing point and non-point water pollution

to enhance storm water quality (Butler and Davies 2004; Sample and Heaney 2006; Walsh 2000; Clary et al. 2002). Besides that, experiences from Australian cities divulge that green infrastructures such as vegetated swale or biofilters might prove exceedingly worthwhile in urban storm water management (CSIRO 1999).

In active participation of community, CBOs and NGOs are also indispensable to mitigate urban flood disasters (Schubeler 1996).

Researcher found a huge gap in the adequate and integrated provision of road and drainage infrastructure because of which Ethiopian cities are struggling to manage urban flood.

3.4 Urban Water Supply

Water supply is a critical infrastructure; without that life is not possible. Ethiopia is a country often known as the water tower of East Africa because of its perennial rivers and great lakes; the country also has the greatest water reserve in Africa (BBC 2004).

Nevertheless, Ethiopian cities are faced with severe deficits in sustainable urban water supply. Salim (2010) inaugurated his literature review from the World Bank discussion paper by citing Churchill (1987), who outlined that in developing countries adequate water supply can improve health conditions by reducing waterborne diseases, mortality and morbidity rates and the number of working days lost, and can increase the GDP.

Later, from the local-level studies, the scholar stated that household income is the determining factor for household water consumption, fluctuating from 300 to 1000 litres per day (Yimer 1992). Additionally, highly educated people consume more water (Tesfaye 1984).

Moreover, the interesting fact is that household, who has lower access to water pay more in comparison to those who have piped water connections, is revealed from Canadian know-hows (MHMRS 2000).

Reports from international agencies confirm that a large portion of urban population (31 %) in big African cities are not serviced with piped water supply connection; only 43 % own yard taps, while 21 % people are served by public taps and rest 5 % by water tankers (WHO 2000).

A household which have access to potable water supply could be defined as households, who receive 20 lpcd water, at an affordable price, or less than 10 % of household income (UN-HABITAT 2003).

Water demand management is a challenging task for service providers, where the water losses and leakage hamper the demand management (Arlosoroff 1999; Mwendera et al. 2003). Total water losses are usually demarcated as unaccounted for water or UFW; some scholars suggest that 10 % of UFW is tolerable (AAWSA 1997; Richard et al. 2000).

Leaking pipelines, illegal water connections, defects in metering and improper accounting are the main reasons for water losses (WHO 2001; Mitchell et al. 2000;

Farley and Trow 2003). According to Macro (2006), water supply sector in Ethiopia is plagued with paucity of services and development due to lack of capacity on management, policy and regulatory matters and to handle planning, operation and maintenance activities. Towns with a population of 2–50 thousands are confronted with adequate water supply challenges in particular (World Bank 2005).

Dessalegn (1999) noted that the creeping development in water supply sector is due to legislation, investment, policy and participation gaps. MWR (2002) admitted that underdevelopment of urban water supply sector is the result of institutional instability, management problems, lack of coordination and weakness in operation and maintenance of the projects.

After 2002, MWR gave a policy slogan for 'full cost recovery and self-reliance' in urban water supply sector, restructuring of water tariffs and incentives to service providers on improving cost recovery was the first strong step towards strengthening of the system (Alebel 2004).

On the basis of literature review of water sector-related challenges, researcher found that the similar problem is still prevailing in most of the Ethiopian towns which deserve comprehensive examination.

3.5 Conclusion

From this chapter, it can be concluded that researcher subjugated broad body of literature at different levels, scales and sources, which was obvious because of complexity inherent in urban infrastructure challenges.

References

AAWSA (1997) Draft report on leak detection study for Addis Ababa water supply and sewerage authority, Addis Ababa

Ahmed MA (2008) An assessment of environmental and socio-economic impacts of improved stoves. The Case of 'Mirt' in Woldia. Unpublished master's thesis, Urban management. Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ahuja DR (1990) Research needs for improving biofuel burning cook stove technologies. Nat Res Forum 14(2). http://onlinelibrary.wiley.com/doi/10.1111/j.1477-8947.1990.tb00378.x/pdf

Alebel B (2004) Analysis of affordability and willingness to pay for improved water supply in urban areas of Ethiopia. In: Proceedings of the conference on management of water resource in Ethiopia, IDR and AAU Press

Arlosoroff S (1999) Water demand management. In: International symposium on efficient water use in urban areas, IECT-WHO, Kobe, Japan

Basak NN (1999) Irrigation engineering. Tata McGraw-Hill Book Company

BBC (2004) Ethiopia fact file. Available at http://news.bbc.co.uk/2/hi/programmes/this_world/3359367.stm. Accessed 30 June 2015

Butler D, Davies J (2004) Urban drainage, 2nd edn. Spon Press, London

Cetinkaya F, Gulmez I, Aydin T, Ozturk Y, Ozesmi M, Demir R (2000) Prevalence of chronic bronchitis and associated risk factors in a rural area of Kayseri. Central Anatolia, Turkey
Churchill A (1987) Rural water supply and sanitation, time for a change. World Bank Discussion Paper 18, Washington, DC
Clary J, Urbonas B, Jones J, Strecker E, Quigley M, O'Brien J (2002) Developing, evaluating and maintaining a standardized storm water BMP effectiveness database. Water Sci Technol 45(7):65–73
CSIRO (1999) Urban storm water, best-practice environmental management guidelines. Victorian Stormwater Committee, CSIRO Publishing
Dessalegn R (1999) Water resource development in Ethiopia: issues of sustainability and participation. Forum for social studies. Discussion Paper No. 1, Addis Ababa
Douglas B, Openshaw K, Smith KR, Van der Plas R (1994) What makes people cook with biomass stoves? Technical Paper No. 242. Energy Series. World Bank, Washington, DC
Douglas I, Alam K (2006) Climate change, urban flooding and the rights of the urban poor in Africa: key findings from six African cities. Action Aid, London
Ergeneman A (2003) Dissemination of improved cook stoves in rural areas of the developing world: recommendations for the Eritrea dissemination of improved stoves program. A study conducted for the Eritrea Energy Research and Training Center (ERTC)
ESMAP (1991) Rwanda: commercialization of improved charcoal stoves and carbonization techniques. Mid-term Progress Report, Energy Sector
Farley M, Trow S (2003) Loss in water distribution networks: a practitioner's guide to assessment, monitoring and control
Gebremariam H (2008) Road and drainage infrastructure as panacea for flood management in Adigrat city, Tigray Regional State of Ethiopia. Unpublished Master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia
Haile Lul T (2002) A scan of sustainable energy, environment and development in Ethiopia at Rio+Ten. Ethiopian Civil Society preparation for Rio+Ten. The Forum For Environment, Book two, Heinric Boll Foundation, Industry and Energy Department, Washington, D.C
Kammen DM (1995) Cook stoves for the developing world. Scientific American
Kothari CR (2004) Research methodology: methods and techniques. New Age Int., Delhi
Marco K (2006) Managing urban futures: sustainability and urban growth in developing countries, 2nd edn. Federal Institute of Technology, Zurich
MHMRS (2000) Safe water supply vital to your health. British Columbia. Available at http://www2.gov.bc.ca/assets/gov/environment/air-land-water/safe-water-supply-vital-health.pdf
Mitchell V, Jackson D, Cooper G (2000) Modelling the urban water cycle
Mwendera E, Hazelton D, Nkhuwa D (2003) Overcoming constraints to the implementation constraints to the implementation of water demand management in southern Africa. Phys Chem Earth Parts A/B/C 28(20–27):761–778
MWR (2002) Ministry of Water Resource Report. FDRE, Addis Ababa
Rajagopal D, Zilberman D (2007) Review of environmental, economic and policy aspects of biofuels the world bank development research group sustainable rural and urban development team. World Bank, Washington, DC
Richard G, Khan A, Lorence R (2000) Monitoring and managing unaccounted for water
Salim B (2010) Strategic assessment of the challenges and potentials of household water supply infrastructure provision and service delivery in Halaba Town, SNNPR. Unpublished Master's thesis. Ethiopian Civil Service University, Urban Management, Addis Ababa, Ethiopia
Sample DJ, Heaney JP (2006) Integrated management of irrigation and urban storm-water infiltration. J Water Resour Plann Manage 132(5):362–373
Schubeler P (1996) Urban management and infrastructure: participation and partnership in urban infrastructure management. World Bank, Washington
Sinha B (2002) The Indian stove program: an insider's view—the role of society, politics, economics and education. National Institute of Science, Technology & Development Studies (NISTADS), CSIR, New Delhi

Smith KR (1994) Health, energy, and greenhouse-gas impacts of biomass combustion in household stoves. Energy Sustain Dev 1(4):23–29

Staton MD, Harding MH (2002) Health and environmental effect of stove uses in developing countries

Tesfaye S (1984) Domestic water consumption pattern in Addis Ababa. Unpublished M.A. thesis, Addis Ababa University, Department of Geography, Addis Ababa

UN-HABITAT (2003) Slums of the world: the faces of urban poverty in the new millennium. Working Paper, UN-HABITAT, Nairobi

Walsh CJ (2000) Urban impacts on the ecology of receiving waters: a framework for assessment, conservation and restoration. Hydrobiologia 431(2):107–114

WHO (2000) World Health Organization. Global water supply and sanitation assessment 2000 Report

WHO (2001) Leakage management and control: a best practice training manual

World Bank (2005) Town water and sanitation. World Bank Publication

Yimer M (1992) Factors affecting household water supply and consumption in Nazareth. Unpublished M.A. thesis. Addis Ababa University, Department of Geography, Addis Ababa

Chapter 4
Review of Findings and Recommendations

Abstract This chapter represents patterns of findings and recommendations of the reviewed research reports. It was observed that energy consumption scenario in the cities is unsustainable; storm water handling fixtures in selected are inadequate, and there is a wide gap between the demand and supply of urban roads and their associated furniture. Urban water supply in the cities is not up to mark in terms of quality and quality while the worth of community participation is not well explored. Moreover, green infrastructure in the cities is not passable. Deficits were also reported in the integration and financing aspects. Additionally, sanitation, health, education, promotion of indigenous material-based urban infrastructure, solid and liquid waste management, ICT infrastructure and tourism infrastructures also faced with several defies. Hence, an exhaustive and integrated plan for urban infrastructure facilities is anticipated on the priority basis.

Keywords Urban road · Water supply · Participation · ICT · Integration · Financing · Sanitation · Health · Education · Indigenous material-based · Solid waste · Liquid waste

4.1 Introduction

This chapter scans findings and recommendations from various research investigations on the challenges of urban infrastructure and services in Ethiopian cities.

4.2 An Overview of Research Findings

4.2.1 Transformation Towards Efficient Energy Infrastructure

In his study, Ahmed (2008) found that fuelwood consumption is the most imperative drivers of deforestation. In his field study in the Woldia city of Amhara region,

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he examined potential sustainable (social, economic and environmental) impact of 'Mirt'[1] stoves, which is expedient in cooking ethnic food injera,[2] and concluded that sound adoption of these improved stoves can have positive social, economic and environmental impacts. It was estimated that average annual biomass consumption in the city was about 16 thousand metric tons that draws 18 thousand cubic metres of fuelwood annually from the city and its surroundings while the adoption of improved stove is saving 1.1 thousand metric tons biomass annually that can be translated into saving of nearly 2 thousand cubic metres of fuelwood. Additionally, it can offer time and money saving, improvement in indoor health conditions, and create employment opportunities, strengthening entrepreneurships through MSEs, though several institutional, financial and individual constraints were identified in achieving these goals.

Studies from Debre Markos in Amhara region and Hawassa in SNNP region endorse above suppositions (Wodaje 2010; Wubishet 2010).

4.2.2 Urban Infrastructure to Handle Storm Water

In studies from Adigrat, Abi-Adi, Alamata (Tigaray region), Dangila, Bahir Dar, Kemessie, Injibara and Dessie (Amhara region), Chiro, Gimbi, Welenchiti, Shashamane (Oromia region), Worabe (SNNP region), Harari (Harari region) and Addis Ababa, researchers pinpointed that the certain areas of these cities are vulnerable to the severity of urban floods due to inadequate quality and quantity of matching drainage lines to the roads, poor road constructions and improper operation and maintenance of existing drainage. Scenario is even worse in some cities because of their undulating topography (Gebremariam 2008; Moges 2008; Dagnachew 2009; Kassaye 2009; Wendale 2010; Tamirat 2010; Adnan 2011; Mustefa 2011; Dereje 2011; Workineh 2011; Zamil 2011; Shanbel 2011; Siraj 2011; Girmay 2011; Mitiku 2011; Beyene 2011). Beniyam (2011) linked inadequacy of storm water drainage with the inability in tackling future climate change.

Dagnachew (2009) used satellite imagery and physical surveys to scrutinize flood prone areas (by storm water) in Addis Ketema subcity of Addis Ababa city and concluded that obstructions of drains, connection of sewers to drains, absence of drain in most cases and clogging of drains with solid wastes diminish carrying capacity of drainage, resultant into heavy urban floods. Additionally, only half of the existing drains were in good condition while others one-fourth were in moderate and rest were in severe conditions. Furthermore, half of the drains are open and on each 1 km of roads only 0.46 km of drainage is available and in the budgets for road

[1]Mirt is an Amharic (national language of Ethiopia) word which means 'best'. It is in fact an improved fuelwood stove made of mortar (a mixture of cement and local sand).

[2]Injera is Ethiopian ethnic flat bread cooked from 'Tef' (millet that contains highly nutrient dietary fibre and iron) flour.

construction less than 1 % is allocated for drainage construction. Inappropriate integration of roads with drainage triggered a number of glitches such as loss in environmental quality, terrific odour in the surroundings, degradation of urban land, loss of aesthetics and breeding of disease causing microorganism in logged water.

Birhanu (2011) examined the scenario in which road and drainage infrastructure is provided in Bishoftu/Debrazait town (Oromia region) and found a huge gap between their demand and supply and advocated that overburdened city administration cannot fulfil entire demand with their existing capacities.

4.2.3 *Constraints on Urban Road Infrastructure and Its Associated Furniture*

Results of a study, in Bishoftu/Debrazait (Oromia region), conclude that less know-how of professionals, financial and resource constraints, higher volume of non-asphalt and non-cobblestone roads, poor practices on road operation, management and maintenance obstruct utility of road infrastructure and cause economic, environmental and social damages (Zeleke 2011).

Glitches concerned to urban road infrastructure, equally been found at Bahir Dar Primary>Bahir Dar in Amhara region, Dire Dawa in Dire Dawa region, Jig-Jiga in Somali region, Robe, Asella, Shashemene and Adama in Oromia region, Dilla in SNNP region, Axum and Mekelle in Tigray region, and Assosa in Benishangul-Gumuz region (Hassen 2009; Kokebe 2009; Zemedkun 2009; Lemessa 2010; Hailemichael 2010; Azmeraw 2011; Said 2011; Niman 2011; Mohammedyakob 2011; Haileyessus 2011; Kalayu 2011; Asnake 2011; Abdissa 2011; Azmeraw 2011).

Fufi (2011) has investigated that road infrastructure in Gimbi town is not well adequate, so is its furniture such as drainage (provided only for 1/5 of the available roads), sidewalks (which is also shared by pedestrians and cyclist), culverts (few in number), loading areas and street lights. Statistics on the quality and quantity of roads in the town is quite disturbing; only 7 km out of total 41 km is asphalt road, about 70 % roads are in poor condition because of maintenance crevice, and street lighting is offered only on 1/3 portion.

4.2.4 *Ensuring Sustainable Water Supply to the Urban Population*

Potable water supply is the most critical infrastructure in an urban area indeed. Ethiopian cities seem highly overstrained in this sector as researchers investigated.

Tmuzghy (2009) concluded that 40 % demand for potable water was unmet in capital city, around 18 % customers were not satisfied with the AAWSA services

and 32 % reported that they are getting water less than 6 h daily. A high rate of UFW (29 %) was recorded in Mekelle (Tigray region) which has an increasing trend and accounts for 6.6 million ETB annually (Kinfe 2009).

Service deficiency was observed in the newly self-aided housing units of Akaki kality subcity (Addis Ababa region) where the residents are dependent for water on standpipes for the construction of their houses, while in most cases (68 %) they were forced to travel more than 2 km for water fetching (Ermias 2009).

Apart from above malfunctions cities like Addis Ababa (Addis Ababa region), Woliata Sodo, Durame, Aleta Wondo, Masha, Dilla, Jinka (SNNP region), Gondar, Bahir Dar, Woldia, Bati, Debre Tabor, Sekota, Dangila, Wegeda (Amhara region), Gimbi, Gebreguarcha, Robe, Aira, Nekemte, Burayu, Adama, Shashamane, Sebeta, Bule Hora, Harawacha, Asella, Dhera, Nedjo (Oromia region), Dilla, Hosanna, Soyama, Tarcha (SNNP region), Shire Endassilasie,Adigrat, Alamata, Humera and Freweyne (Tigray region) Mandura (Benishangul-Gumuz region) are also confronted with several water supply-related challenges such as unmet demands of potable water, poor quality of supplied water, inadequate and inequitable distribution of public tap stands, unfair water tariffs, frequent interruptions in the supply, leakage of water pipe lines and inadequate number of technical workforce (Abera 2010; Alemayehu 2010a, b; Asfaw 2010; Desalegn 2010; Bedada 2010; Bekele 2010; Berihun 2010; Birhanu 2010; Birishet 2010; Degenet 2010; Gelane 2010; Lulu 2010; Maru 2010; Mesfin 2010; Mohammed 2010; Selamwit 2010; Semeneh 2010; Tesema 2010; Kumulachew 2010; Aklilu 2010; Belete 2010; Tesgaye 2010; Abdi 2011; Adem 2011a, b; Aden 2011; Alemu 2011; Amanuel 2011; Amsalu 2011a, b; Brhanu 2011; Getachew 2011a, b, c; Haftamu 2011; Hussien 2011; Mulugeta 2011; Mengistu 2011; Meskerem 2011; Mohammed 2011a, b; Negese 2011; Shishay 2011; Sisay (2011; Yesuf 2011; Abraham 2011; Welancho 2011 and Shimeri 2011).

Salim (2010) in his research inquiry of Halaba (SNNP region) confirmed that the water tariffs are not realistic in the town as poor people (without household water connections) are paying more compared to the connected households, employees of water board are less skilled and less paid that hampers their commitment, even the policymaking body lacks planners and technocrats, and above of all effective monitoring and evaluation mechanism is ambiguous.

Customer satisfaction was examined in Ambo (Oromia region) and it was proven that more than one-third of total customers (36 %) were unhappy with the water supply services and almost half of them (47 %) complained that staff of provider agency is not supportive and helpful to the customers, and majority of the customers (47 %) were eager to see improvement in the level of services (Dereje 2010), and quite similar results were drawn in Wolliso town of Oromia region (Negussie 2011).

It was also concluded that groundwater water table tends to decline in Nekemte (Oromia region) especially in the dry seasons consequential into widening of demand and supply gaps, worsening already unmet demands (Belay 2010).

The case study of Dubti town (Abdu 2010) divulges that in the last decade the population has been doubled due to shift in the capital of region from Aysaita to

Semera and because of the establishment of a sugar project near the town, which has overstressed town's water supply capacity indeed.

Aging water system and their low capacities has worsened the problem. Apart from this no service standards are determined by the authorities to ensure sustainable water supply in the town while the water tariffs are not realistic.

Meseret (2008) found that the city of Dessie is combating with the challenges of water supply having inadequate financial and human resources. The absence of land titles is obstructing the new household connections while irregular operation and maintenance leads to leaking of supply lines. Later, Ahmed (2010) recognized that in Dessie DWSSO planned to expand its service area up to 87 % households though by year 2010 the achievement was only 34 %.

Coverage and quality of the water supply services is poor in newly inhabited areas. Non-revenue water and cost recovery is a bewildering issue of concern in the town (Taye 2011).

Research on water supply inconsistencies in Jig-Jiga town (Somali region) is vital to understand infrastructure state of the region as no studies are available for this particular region. Abdisamad (2010) pointed out managerial and human resource-related deficiencies in JWSO; water supply system lacks proper operation and maintenance practices while established in 1975; the system do not possess an efficient asset management plan.

4.2.5 Community Involvement in Urban Infrastructure Works

A study of Chiro town in Oromia region (Teka 2010) shows that involvement of community in the water infrastructure projects is too slender, although high involvement of community members was recorded in the phase problem identification (85 %) which has been narrowed in other succeeding phases such as construction (75 %). Moreover, it is imperative to mention that no community member was contacted and consulted while making decisions regarding location of the water supply project and its genus; local authorities solely took the resolutions. Management of water supply facility was being executed through community representatives (through water management committees) and they also feel that there was lack of transparency in the fund management. It was also proven that the water management committees neither have capacity nor skills to fairly operate and maintain such facilities. It was observed that the tariff collected from users was not enough to cover operation and maintenance cost of the project, resultant into their poor condition.

Community participation in education infrastructure provision was reported low in Shire-Inda selassie town of Tigray region and Holeta town of Oromia region (Measho 2011). Lack of community involvement was also reported insignificant in urban water supply projects at Jig-Jiga town of Somali region (Mohammed 2011a, b).

4.2.6 Focus on Green Infrastructure

Green infrastructure is an embryonic theme among the scholars in Ethiopian context, indeed. In fact, green infrastructure possesses multifaceted value because of the various psychological services offered by it which determines the quality of life in cities and to diminish ecological stress on the city life (Chiesura 2004; Mell 2010; Schäffler and Swilling 2013).

In Arsi Negelle town (Oromia region) green infrastructure is overburdened with other land uses like residential, commercial, religious, cemeteries, bus stations and temporary markets (Beyene 2010). Quality and quantity of green infrastructure is also not reasonable in Debra Markos town (Amhara region); existing green infrastructure is dwindling due to increasing fuelwood demand, urban growth and land-use changes (Tiruset 2010). Green infrastructures are also stressed in Mekelle (Tigray region), Kamise (Amhara region) Assossa town (Benishangul-Gumuz region), Arada subcity (Addis Ababa region), Nekemte, Yabello and Goba (Oromia region) cities (Senbeta 2009; Abdulahi 2010; Alganesh 2011; Mechal 2011; Eyader 2011; Genet 2011).

In Goba town (Oromia region), Abdulahi (2010) found that existing green infrastructure is rapidly shrinking due to rapid changes in land uses from green and open spaces to residential, commercial and mixed uses, which made local residents unsatisfied. Existing green infrastructure is not well protected; stakeholder's participation in the expansion of green infrastructure is quite low, and vacant open spaces are encroached with solid wastes, especially along with the drains and river banks. Due to the absence of green infrastructure, the solid wastes dumped on vacant spaces flows with storm water and falls down into rivers causing health risks. The town failed to properly implement its 'Development plan-2002' as 20 green spaces were planned while only nine were executed. There is no proper inventory of green infrastructure, and stakeholders at local level consider it as a nonproductive entity.

4.2.7 Muddling on Institutional Integration for Urban Infrastructure Provision and Management

Various infrastructure providers in the cities do not have an integrated system which affects adjacent infrastructures while doing construction or repair works for others. The practice is quite alike into urban fabrics across the country; a study of Bahir Dar city in Amhara region (Abiy 2010) unveils that because of poor institutional integration among ETC, EEPCO and BDCA cause recurrent interruptions and damage the utility lines, especially of water supply; improper communication among institutions, lack of common special database and absence of real-time monitoring system are the basic reasons responsible.

Very similar findings were drawn by the researchers in case of Addis Ababa in Addis Ababa region, Adigrat and Mekelle in Tigray region, Dembi Dollo and Sebeta in Oromia region (Dereje 2009; Michael 2009; Alemayehu 2010a, b; Getachew 2011a, b, c; Hailekiros 2011).

Moges (2011) with an example of Bahir Dar in Amhara region indicated that there is still a huge gap in urban policies guiding to institutional integration in the provision and management of urban infrastructures.

4.2.8 Gaps in the Provision of Social Infrastructure

4.2.8.1 Education

In the city of Jimma (Oromia region) it was observed that the physical infrastructure in the government school (from pre-primary to preparatory level) is not satisfactory. There is inadequacy of tables, chairs and quality of buildings, while the shortage of green and open spaces and land for future expansion is also aggravating the problem. The absence of good governance and the lack of community participation in the planning and budgeting of school are thought to be major reasons for such cracks, which is when the most popular school in the city is being run through community resources, although the scenario is slightly changing, because of the increasing involvement of the private sector (Kifle 2008).

Investigations from Adiremets and Alamata in Tigray region, Arerti in Amhara region and Asella in Oromia region, and Bele and Bonga in SNNP region sanction that the existing educational infrastructure is not capable to achieve the target to maximize access, coverage, quality, equity and efficiency in primary and secondary education (Leykun 2011; Million 2011; Seboka 2011; Teshome 2011; Helen 2011; Amine 2011).

4.2.8.2 Health

Jimma city is also facing challenges in offering an appropriate health infrastructure to its dwellers in terms of quality and quality; there is a wide gap in the demand and supply of health services. City is lagging behind in many health fronts such as management of HIV/AIDS, the rate of infant mortality and the rate of maternal mortality which is still higher (Kifle 2008). Research inquiries in Dire Dawa (Dire Dawa city region), Gerbaguracha,Gimbi (Oromia region), Bahir Dar (Amhara region), Worabe, Durame (SNNP region), Addis Ababa (Addis Ababa region) and Harari (Harari region) pronounce similar impression (Hailab 2009; Selamwit 2011; Amsalu 2011a, b; Haregua 2011; Dibera 2011; Koat 2011; Meseret 2011; Munir 2011; Tewfik 2011).

Werede (2011) carried out a comparative study between government and private delivery of healthcare services in Mekelle (Tigray region) and concluded while

government sector offers more affordable services, but on one hand it cannot fulfil total demand, and on the other hand, the quality of services is also poor; on the contrary, private sector services are not affordable for poor people but the quality of services is quite better.

Provision of healthcare infrastructure in Hawassa city (SNNP region) is inadequate in reference to national standard which guides to establish 1 hospital for 250 thousands, health center on 25 thousands and health post on 5 thousands populations.[3] On one hand private healthcare service providers have an important share in service delivery and it is not affordable for the most of the residents, while on the other hand private providers play very limited role in the prevention of health problems.

Government as a regulator is lethargic in monitoring the private providers. Improper adherence to WHO standards, insufficient community consultation and participation in healthcare service planning and delivery, slow delivery, deficit of drugs, small number of hospital beds, scarcity of instruments and professionals, and frequent interruptions in water and electricity supplies are among the major shortcomings of healthcare infrastructure (Abiot 2009).

4.2.9 Appraisal of Indigenous Material-Based/ Labour-Intensive Urban Infrastructure Provision

Cobblestone road construction technologies were brought to Ethiopian cities by GIZ (previously known as GTZ) in the year 2006 because of its two main virtues: at first it uses local raw materials and second it gives large scale employment to local unskilled workforce as it is labour-intensive.

The cobblestone road project has greater significance to employ of local skills and to exploit local resources efficiently. Savings of foreign currency, freedom from market uncertainties, better durability and less construction costs, less construction time, longer lifespan, easier and low-cost operation and maintenance are the reasons government and international agencies have promoted such type of technologies.

Cobblestone technology is ecofriendly too as it produces less wastes and do not increase the temperature in its surroundings as compared to asphalt roads. Despite of all its advantages, scholars divulged that the cobblestone projects in cities like Dire Dawa, Addis Ababa, Hosanna, Hawassa, Bahir Dar, Adama and Arba Minch are oppressed from administrative apathy, financial mismanagement, carelessness towards safety standards, weak logistics, poor integration among implementing institutions (such as DDMO, DDRA, DDFEDO, DDCDEO and RMSEDA in Dire Dawa) and pathetic capacities of MSEs (Ahmednur 2009; Shewarega 2009;

[3]As per guidelines of Federal Ministry of Health in Ethiopian Health Policy.

Mola 2010; Solomom 2010; Yeshiwas 2010; Adem 2011a, b; Assefa 2011; Nasra 2011; Wube 2011).

Natural soil stabilization technology is another labour-intensive technique deployed for urban road provision in Ethiopian cities; researcher examined the technology in Addis Ababa (Addis Ababa region) and concluded that the technology has great potential though it is not popular due to apathy of policymakers (Wubiye 2011).

4.2.10 Infrastructure for Sanitation, Solid Waste and Liquid Waste Management

Dream light project is an ambitious project in Bhairdar city (Amhara region) to ensure sustainable solid waste management. Fentahun (2010) evaluated effectiveness of this project and concluded that the project has on average coverage of 89 % and still 6500 m^3 of solid wastes remain uncollected, and disposed on the riverbanks, streets, storm water drainage and open spaces. Disposal site is unprotected, while reuse, recycle and composting practices are uncommon. The project excludes chemical, industrial and healthcare wastes.

Solid waste collected in Dessie (Oromia region) is around 50 % (quite lesser than Bahir Dar) which is mainly due to lack of technical, financial and resource capacity at the municipality (Getnet 2010). Similar observations were made from Assosa in Benishangul-Gumuz region, Hosanna and Wolaita Sodo in SNNP region, Humera and Alamata in Tigray region and Nekemte and Gimbi in Oromia region (Kinfe 2010; Tadelech 2010; Demelash 2010; Goitam 2010; G/hiwot 2010; Asnakech 2010; Merga 2011).

Researchers found that poor sanitation and solid waste management impedes urban health and livability. Alazar (2011) noted that only 14 % residents have access to improved sanitation facilities in Bahir Dar (Amhara region), 76 % rely upon tradition unimproved sanitation facilities (including open toilets), while the rest 10 % are still practicing open defecation; 11 % solid waste in the city remain uncollected and no proper treatment of wastewater/sewer is in place that are released into open spaces and water bodies increasing incidents of waterborne diseases.

Unreliable water supply encumbers health and hygienic behaviors such as washing of hands. Similar findings were documented in Hrari city of Hrari region (Herya 2010).

Study in Chiro town of Oromia region noted that health problems are in severe form because of compromised sanitation infrastructure; further, it was found that majority of households (45 %) in town were grieved with diseases caused by unsanitary conditions, and the rate was even higher (65 %) among children (Bedassa 2011).

4.2.11 Urban ICT Infrastructure

ICT applications can increase efficiency of urban land administration and management though in Addis Ababa because of budgetary constraints, higher costs of hardware and software, lack of ICT professionals, limited access to WAN/LAN and improper connectivity to web portal and Internet are obstructing such applications (Zena 2011). A study reveals that government sector is reluctant in adopting ICTs due to capacity constraints in Hawassa city of SNNP region (Gizaw 2010).

Yeshiemebet (2011) found that despite of all the efficiencies, ICTs can offer AACA that is still relying on outdated modes of communication, documentation, field and office management which obstructs sustainable infrastructure management indeed.

Getacher (2011) divulges that government schools of Addis Ababa lack ICT infrastructure including LCD projectors, LCD televisions, audio and video players and desktop computers which may prove valuable in competing with private school and improving quality of education.

4.2.12 Challenges on Financing Urban Infrastructure and Services

Almost all the research investigations concluded that financial constraints are the major obstacles in the way of provision, operation, management and maintenance of urban infrastructure and services in Ethiopian cities, a few unambiguously tackled the defy. In Dubti town (Afar region), the researcher noted that healthcare services are not financially sovereign as they are solely dependent on regional state grant and donations, while their own resources (user fees) are very limited that hinders their services in terms of both the quality and quantity. Although AMREF, UNICEF, Global Fund and I-TECH offer financial resources in terms of cash, grants and aids for hiring health professional and payments of their salaries, sponsoring trainings for health workers and supply of medicines and instruments but these assistances are not being efficiently utilized as the monitoring and evaluation mechanism is not well in place (Hadra 2011). Study in Bedassa (Oromia region) exposes the same hitches (Mebruka 2011).

Study from Debra Markos (Amhara region) and Mekelle (Tigray region) unveiled that water supply project in the town still rely on traditional financing sources such as grants from regional governments, donors with a little income from water user charges that are not sufficient for the cost recovery and make the project sustainable, while there are high losses due to UFW (Getachew 2011a, b, c; Wesenseged 2011).

4.2.13 Urban Infrastructure for Tourism Development

Ethiopian cities are center of attraction for tourists since long because of their rich heritage and ethnic diversity. Tourism is source of livelihood for local residents in cities like Bahir Dar and Debark in Amhara region, Addis Ababa in Addis Ababa region, Dire Dawa in Dire Dawa region, Harari in Harari region, Korem and Axum in Tigray region and Bishoftu/Debrazait in Oromia region.

All the researchers were in agreement that additional urban infrastructures are required to attain tourism sector development, while Ethiopian cities in general do not have its adequate stock; both the tourists and local residents including the individual tourism service providers are largely (42–80 %) not satisfied with existing infrastructure and rated their condition as 'poor' (Yohannes 2009; Fahmi 2010; Habatamu 2010; Mesfin 2010a, b; Shakir 2010; Leul 2010; Abraha 2011; Merkebu 2011; Nestanet 2011).

4.2.14 Other Prudent Themes in Urban Infrastructure Research

Researcher observed in Hawassa (SNNP region) that design defects in an urban infrastructure such as road, together with their poor operation, maintenance and governance, can not only reduce their utility though it can also harmfully upset quality of people's health and life; consequences could be even worse in the case of physically challenged–visually handicapped in particular (Dinkayehu 2011; Samuel 2011).

Wointu (2011) alleged that infrastructure asset management is an overlooked realm in AAWSA that decreases efficiency of water supply services in Addis Ababa (Addis Ababa region); this deficiency lowers performance level of the service provider in the operation and maintenance.

Gambella is one of the emergent regions in Ethiopia where Gambella is its capital city; a study on the city found that overall level of infrastructure and services is poor because of data unavailability, lack of capacities related to planning, resources, finance, operation, maintenance and management. Lack of awareness and participation from community members has intensified the shortcomings (Gadet 2010).

In Modjo-Lume area of Oromia region, Sisay (2009) pointed out that infrastructure development could contribute in the sustainable urban and regional growth by enhancing urban–rural linkages; it was proven that better provision of road connectivity in Lume area can increase market potentials of rural products (vegetables, fruits and dairy) by minimizing travel time, while the Modjo town can get additional incomes by offering marketplace to these products.

Nigus (2011) made a highly pertinent observation that Ethiopia got its first comprehensive Urban Development policy in 2004 with due attention on urban

infrastructure component though initially it was highly stressed with political decisions and financial challenges. Later, the progress in the sector has been seen with the help of international development agencies such as GIZ, US-AID, World Bank and with the application of strategic management tools like SWOT, PEST, BSC, BPR and innovative management and financing options through PPP.

4.3 Pattern of Recommendations and Offered Solutions

Nearly, all researchers were in agreement to bring about certain policy-level reforms to efficiently provide urban infrastructure and services in Ethiopian cities which are as follows:

4.3.1 Strengthening the Institutional Setup

Government service providers in Ethiopian cities need a complete refurbishing including the following:

- Appointing expert members in the executive boards, having expertise in planning, finance, accounting and technical aspects.
- Revision of remunerations to the officials and staff to avoid higher turnover rates.
- Keeping the updated record for the specialized human resource requirements in different trades and making appointments proactively.
- Starting proper asset management practices on finance and other resources.

4.3.2 Capacity Building on Managerial Issues

It is a felt need that institutions and organization related to urban infrastructure and services are seriously lacking on managerial capacities that should be carefully tackled through the following:

- Preparing a smart strategic plan in real sense, based on comprehensive analysis of available resources.
- Offering of on-job training to staff on regular basis.
- Making a dynamic user tariffs for all the services while keeping in mind the affordability for poor and cost recovery for the infrastructure services itself.
- Providing micro-credits to the poor, especially to the water poor who cannot afford higher initial costs for the new connections.

- Optimizing production and distribution /supply capacities for the infrastructure and services.
- Ensuring early detection of losses, if any.
- Keeping proactive management plan for the operation and maintenance of the infrastructure and services.

4.3.3 Popular Consultation and Participation of Stakeholders

There should be greater emphasis on the consultation with different stakeholders on the planning, financing, delivery, operation, maintenance and management of the infrastructure and services; all possible stakeholders and consensus makers including NGOs, CBOs and private sectors should be encouraged to participate actively in the processes.

4.3.4 Promote Institutional Integration

Urban infrastructure and services that are offered in an urban fabric are functionally interdependent, and vulnerability in a system influences others; hence, their proper operation and protection requires collaborative decision-making (Samborski 2010). Institutional integration for collaborative decision-making could be accomplished through the following:

- A vertical framework should be created for the anticipated integration across the various levels of governance-federal, regional and local.
- Horizontal integration should be carried out through city-level inter-organizational channel.

4.3.5 Creating an Effective Monitoring and Evaluation Framework

To check the health of the urban infrastructure and services in Ethiopian cities, an effective monitoring and evaluation framework should be established as per the following suggestions:

- Benchmarking service standards and indicators for each infrastructure service and for every town exclusively.
- Deploying independent professionals for unbiased monitoring and evaluation.

- Using ICT-based modern devices at large, for speedy monitoring and evaluation.
- Community members should be involved adequately to keep the monitoring and evaluation process transparent.

4.3.6 Opt for ICTs

Advantages of ICTs are indisputable; it has ability to make urban infrastructure management practices more efficient and sustainable. The tasks commended for Ethiopian cities are as follows:

- Uses of ICT for informing community members/service users on and creating awareness among them to increase participation.
- Keep the urban infrastructure management process transparent through creating interactive web portals and information kiosks.
- ICTs should be used for sustainable asset management.
- Geospatial database should be created for effective planning controls.
- ICTs can help in the effective monitoring and evaluation of urban infrastructure works.

4.3.7 Creating Partnerships

By now it has been soundly concluded that government alone cannot offer sustainable urban infrastructure; this notion calls for two major partnerships:

- PPP for urban infrastructure management and
- Community contracting.

4.4 Conclusion

This chapter delineated the synopsis of the findings and recommendations made by the researchers to make urban infrastructure services more accessible, adequate, reliable, affordable and efficient in Ethiopian cities. These options include sustainable provision of urban infrastructure and services in terms of quality and quantity through strengthening of institutional setup, capacity building on management strategies, improve community partnerships, encourage institutional integration, efficient monitoring and evaluation, application of ICTs and innovations in partnerships.

References

Abdi K (2011) Constraints and prospects of water supply infrastructure and services delivery in Aira town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdisamad O (2010) Study of challenges in managing urban water supply infrastructure in Jig-Jiga town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdissa D (2011) An assessment of road infrastructure provision and management in Asella town, Oromia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdu M (2010) Assessment of water supply in Afar national regional state: the case of Dubti town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abdulahi M (2010) An assessment of the situation of urban green infrastructure provision in Goba town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abera B (2010) An assessment of domestic water supply and service in the case of Akaki Kaliti sub city of Addis Ababa city administration. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abiot T (2009) Assessment of healthcare infrastructure provision and management in medium sized cities of ET: the case of Hawassa city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abiy H (2010) Challenges and prospects of integrated infrastructure provision and management-the case of Bahir Dar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abraha K (2011) The contribution of infrastructure provision to tourism development: a case study of Addis Ababa city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Abraham T (2011) Assessment of water supply infrastructure and service delivery in Nedjo town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Adem A (2011) Cobblestone pavement as an alternative in the road infrastructure provision and its contributions in reducing unemployment, a case study of Adama city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Adem A (2011) Challenges, prospects of water supply infrastructure provision and is service deliver in Debre-Tabor town—Amhara region. Un-published master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Aden H (2011) Assessment of water supply infrastructure and service provision in Soyama town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Adnan A (2011) An assessment of the provision of urban drainage infrastructure in Wolkitte town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ahmed MA (2008) An assessment of environmental and socio-economic impacts of improved stoves. the case of 'Mirt' in Woldia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ahmed E (2010) An assessment of water supply infrastructure and service delivery in Dessie town, Amhara region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ahmednur M (2009) Challenges and opportunities of cobblestone road infrastructure projects in Dire Dawa. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Aklilu H (2010) Analysis of water supply infrastructure in Dilla town: Gedeo zone, SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alazar SB (2011) Assessment of the effect of inadequate sanitation infrastructure and service provision on human health in the case of Bahir Dar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alemayehu B (2010a) Assessment of water supply infrastructure provision and service-the case of Woliata Sodo town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alemayehu GMA (2010b) Challenges and prospects for integrated infrastructure provision and management in tertiary towns of ET: a case of Dembi Dollo town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alemu A (2011) An assessment of water supply infrastructure provision and service delivery-the case of Humera town, Tigray. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Alganesh AT (2011) Problems and prospects in the provision and management of green infrastructure; the case of Mekele city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amanuel TB (2011) An assessment of water supply in-frastructure and service delivery in Nekemte city administration, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amine D (2011) Analysis of educational infrastructure provision & services in Adigrat town, Tigray region, Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amsalu AA (2011) An assessment of public healthcare infra-structure and service delivery in Bahir Dar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Amsalu TA (2011) Impact of urban growth on water supply infrastructure and its provision: the case of Burayu town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Asfaw TM (2010) An assessment of water supply and service delivery in Gondar town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Asnake Y (2011) An assessment of operation and maintenance of road infrastructure in Bahir Dar city, Amhara region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Asnakech KF (2010) Assessment of solid waste infrastructure management: a case of Nekemte town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Assefa KA (2011) Opportunities and challenges of the labor intensive constructions (cobblestone) in Addis Ababa. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Azmeraw MZ (2011) An assessment of the economic role of road infrastructure in Bahir Dar city administration. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Bedada AD (2010) Water supply infrastructure and service de-livery in Gebreguracha town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Bedassa RS (2011) Effect of inadequate sanitation infrastructure on human health in Chiro town, Oromia regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Bekele AA (2010) Assessment of household water supply and sanitation service in Bahir Dar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Belay GJ (2010) Innovative options for strengthening water supply infrastructure management and service delivery in Nekemte city administration. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Belete A (2010) Analysis of water supply infrastructure management in Jinka town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Beniyam FK (2011) An assessment of challenges and prospects of storm water drainage infrastructure management in Kemessie town-Amhara region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Berihun YD (2010) Challenges and prospects of water supply infra-structure and service delivery-the case of Woldia town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Beyene G (2010) An assessment of urban green infrastructure provision and management: the case of Arsi Negelle town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Beyene FH (2011) Analysis of causes and effects of delay in road and drainage construction projects in Dessie city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Birhanu E (2010) Challenges of urban water supply and service provision: the case of Dilla Town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Birhanu DG (2011) Potentials of public private partnerships in integrated road and drainage infrastructure provision-the case of Bishoftu town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Birishet GA (2010) Assessment of water supply and service (the case of Shire Endassilasie town, Tigray region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Brhanu KA (2011) An assessment of water supply infrastructure and service delivery-in the case of Sekota town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Chiesura A (2004) The role of urban parks for the sustainable city. Landscape Urban Plan 68:129–138

Dagnachew A (2009) An assessment of the integration between road and urban storm water drainage network in Addis Ababa: Addis Ketema sub-city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Degenet HD (2010) The status of water supply systems and service provision in Durame town (SNNPR). Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Demelash D (2010) Analysis of challenges in managing municipal solid waste infrastructure in Wolaita Sodo town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dereje G (2009) Impacts and opportunities of integrated infrastructure provision and management in Addis Ababa-the case of road and road related infrastructure. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dereje B (2010) An assessment of customer satisfaction on service provision and management of water supply in Ambo town of Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dereje MC (2011) The challenges of urban drainage infrastructure—the case of Chiro town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Desalegn FE (2010) Assessment of water supply infrastructure and service delivery in Gimbi Town-Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dibera FS (2011) Healthcare infrastructure provision and service delivery in case of Gimbi town, Oromia region, Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Dinkayehu B (2011) An assessment of factors affecting road safety the case of Hawassa city, SNNPR, Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Ermias DB (2009) Water infrastructure provision for new self aided residential housing development cooperatives project site in Akaki Kality subcity. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Eyader A (2011) An assessment of green infrastructure provision and management in Assossa town, Benishangul Gumuz region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Fahmi M (2010) An assessment on impact of infrastructure provision on tourism development in Harari region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Fentahun WA (2010) The effectiveness of dream light project on solid waste management infrastructure. the case of Bahir-Dar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Fufi DD (2011) An assessment of provision and maintenance of road infrastructure and its role on urban development of Gimbi town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gadet TD (2010) Municipal services in Gambella town: challenges and solutions. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gebrehiwot G (2010) An assessment of solid waste infrastructure management; a case of Alamata town administration. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gebremariam H (2008) Road and drainage infrastructure as panacea for flood management in Adigrat city, Tigray regional state of Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gelane TW (2010) A thesis on an assessment of water supply provision in Robe town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Genet A (2011) A study on green infrastructure management: challenges and opportunities in Arada sub-city, Addis Ababa City administration. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getacher G (2011) Assessment of the role of ICT infrastructure and service for the development of education in Kolfe Keranio sub city, Addis Ababa. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getachew G (2011) Operation and maintenance of water supply infrastructure system in Dangila town, Amhara national regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getachew NT (2011) Assessment of challenge and prospects of integrated infrastructure provision and management in Sebeta town-Oromia regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getachew T (2011) The challenges and opportunities of financing water supply infrastructure in Debre Markos town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Getnet AB (2010) An assessment of solid waste management infra-structure in Dessie city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Girmay Z (2011) An evaluation of drainage infrastructure for storm water management in Alamata town-Tigray region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Gizaw SW (2010) Evaluation of ICT applications in urban local governance development-the case of Hawassa city SNNPR state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Goitam T (2010) An assessment of solid waste management system in Setit Humera town, Tigray region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Habtamu S (2010) Challenges and opportunities of tourism development in Bahir Dar city, Amhara regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hadra H (2011) Health care infrastructure financing in Dubti town-Afar region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Haftamu BG (2011) An assessment of water supply and sanitation infrastructure provision and management: the case of Freweyne town, Tigray regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hailab W (2009) An assessment of healthcare infrastructure and service provision in Dire Dawa city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hailekiros T (2011) Integrated infrastructure provision for new formal residential settlement-the case of Mekelle city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hailemichael WS (2010) An assessment of community participation in the planning construction and maintenance of urban road infrastructure-the case of Mekelle city Tigray region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Haileyessus E (2011) An assessment of road infrastructure in Dilla town, SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Haregua B (2011) An assessment of healthcare infrastructure and service delivery in Bahir Dar City-Amhara national regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hassen G (2009) The impact of road infrastructure on the development of Shashemene city: Oromia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Helen D (2011) Evaluation of secondary education infrastructure and service provision in Bonga town (SNNPR). Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Herya M (2010) Impact of poor sanitation infrastructure on human health in Harar town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Hussien B (2011) An assessment of factors affecting water supply in Adama city-Oromia region, Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kalayu FD (2011) The role of road infrastructure provision on urban development in Axum town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kassaye AB (2009) Assessment of storm water drainage infrastructure in Gimbi town: Oromia region, West Wollega zone. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kifle B (2008) Millennium development goals based social infra-structure and service provision need assessment of ET: the case of Jimma city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kinfe G (2009) Household water supply infrastructure accessibility in Mekelle city, Tigrai region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kinfe B (2010) On assessment of solid waste management and service provision the case of Assosa town. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Koat MP (2011) A study of health care service delivery and customer satisfaction in Yeka subcity, Addis Ababa, Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kokebe Y (2009) A study on the assessment of road infrastructure provision and management in Adama city, Oromia national regional state of Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Kumulachew DG (2010) An assessment of factor affecting pipe water demand and supply-the case of Masha town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Lemessa E (2010) An assessment of road infrastructure and its implications on urban development in Assosa town, Benishangul Gumuz region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Leul N (2010) Impact of infrastructure provision on tourism development at Axum town, Tigray. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Leykun BT (2011) Assessment of educational infrastructure and service provision in Adiremets town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Lulu GA (2010) Factors determining household water supply and consumption level in Addis Ababa: the case of Bole sub-city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Maru L (2010) An assessment of water supply and sanitation service in AA, case of Yeka sub city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Measho TT (2011) An assessment of community participation in educational infrastructure planning and service delivery: the case of Shire-Indaslassie town, Tigray regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mebruka M (2011) Financing healthcare infrastructure in Bedessa town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mechal MZ (2011) Assessment of green infrastructure provision and it's management in Kamise town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mell IC (2010) Green infrastructure planning—integrating connectivity and multi-functionality with linear and large scale developments. Landscape Archit China 9(1):131–143

Mengistu BO (2011) Impacts of urban horizontal expansion on drinking water supply and its service delivery in Sebata town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Merga T (2011) An assessment of the impact of urban growth on sanitation infrastructure and services delivery in case of Ghimbi town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Merkebu L (2011) Assessment of the impact of tourism infrastructure on city's development a case of Bahir Dar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Meseret A (2008) Analysis of household water accessibility in Dessie town of Amhara regional state, Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Meseret A (2011) The impact of infrastructure provision and management on health care service delivery: the case of Durame town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mesfin A (2010) Impacts of urban expansion on water supply system in Adigrat town, Tigray regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mesfin N (2010) Infrastructure provision and management for tourism industry development in Korem town and its fringe area, Tigray regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Meskerem BB (2011) Challenges in water supply infrastructure provision and service management in Bule Hora town administration Oromia region, Ethiopia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Michael HB (2009) Challenges and prospects of integrated infrastructure provision and management in Adigrat-Tigary. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Millon SB (2011) Assessment of community participation in educational infrastructure service provision and management in primary schools of Arerti town, Amhara region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mitiku NM (2011) Challenges and prospects in road and drainage infrastructure provision and management the case of Gimbi town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Moges SGM (2008) Towards an integrated road and storm water drainage infrastructure development in Bahir Dar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Moges BM (2011) Assessment of government urban policy in relation with integrated urban physical infrastructure provision and services—the case of Bahir Dar city, Amhara national regional state. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammed E (2010) An assessment of water supply infrastructure and service in Bati town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammed A (2011) Challenges towards water supply infrastructure provision and service delivery in Harawacha town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammed OB (2011) Assessment of community participation in water supply infrastructure management in Jig-Jiga town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mohammedyakob KA (2011) Assessment of the road infrastructure provision and management in Robe town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mola A (2010) Strategic assessment of achievements and challenges in the implementation of cobblestone roads construction in Hossana town, SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mulugeta LA (2011) Management of water supply infrastructure operation and maintenance in Shashemene town, Oromia region: a situational analysis. Unpublished master's thesis, Urban Management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Munir AY (2011) An assessment of health infrastructure and service delivery-the case of Harar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Mustefa EA (2011) Assessment of drainage infrastructure provision and management the case of Worabe town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Nasra S (2011) An assessment of challenges and opportunities for cobblestone road infrastructure projects in Mekelle City-Tigray region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Negese LM (2011) Assessing the challenges for sustainable water supply services delivery in Asella town-Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Negussie DB (2011) An assessment of water supply and customer satisfaction in Wolliso town, Oromia. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Nestanet G (2011) Infrastructure provision for tourism development in Bishoftu town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Nigus T (2011) Assessment of ethiopian urban development policy. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Niman ME (2011) The impact of road infrastructure provision on urban economic development-the case of Jig-Jiga town, Somali regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Said M (2011) An assessment of road infrastructure provision and management in Dire Dawa city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Salim B (2010) Strategic assessment of the challenges and potentials of household water supply infrastructure provision and service delivery in Halaba town, SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Samborski RM (2010) Everything is somewhere infrastructure is everywhere, Geospatial world. Available at http://geospatialworld.net/Magazine/MArticleView.aspx?aid=18763. Accessed 30 June 2015

Samuel D (2011) Road infrastructure provision for visually handicapped: the case study of Hawassa city SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Schäffler A, Swilling M (2013) Valuing green infrastructure in an urban environment under pressure—The Johannesburg case. Ecol Econ 86(2013):246–257

Seboka HG (2011) The demand for primary education infrastructure and its provision the case of Asella town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Selamawit T (2010) An assessment of water supply infrastructure and service in Hossana town, SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Selamawit BG (2011) The status of health care infrastructure and health care service delivery in Oromia region: the case of Gerbaguracha town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Semeneh A (2010) Assessment of urban water supply services in Man-dura town, Benishangul Gumuz regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Senbeta A (2009) Evaluation of urban green infrastructure: the case of Nekemte town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shakir AY (2010) The role of integrated infrastructure provision in tourism development a case of Harar town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shanbel WA (2011) Importance of drainage infrastructure in flood management the case of Welenchiti town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shewarega S (2009) Challenges and opportunities for cobblestone road construction in the provision of infrastructure and poverty reduction in Hawassa city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shimeri M (2011) Assessment of challenges and service delivery of water supply in Burayu town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Shishay M (2011) An assessment of water supply and service delivery a case study in Mekelle Quiha sub city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Siraj MJ (2011) An assessment of urban drainage infrastructure and flood management, Abi-Adi town, Tigray region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Sisay A (2009) Infrastructure provision as a tool in rural—urban linkages: a case of Modjo and Lume area. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Sisay AM (2011) Assessment of water supply and sanitation service provision Wegeda town, South Gonder, Amhara region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Solomon L (2010) An assessment of the application of labour-based construction: the case of Addis Ababa city cobblestone project. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tadelech AB (2010) An assessment of solid waste infrastructure management the case of Hosanna town, SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tamirat TM (2010) An assessment of urban flood management on infrastructure in Shashamane city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Taye MG (2011) Assessment of non-revenue water and cost recovery on urban water supply in case of Dessie city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Teka AA (2010) An assessment of community participation for sustainability of water supply infrastructure project: the case of Chira town of Oromia national regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tesema KA (2010) An assessment of water supply infrastructure and service provision in case of Aleta Wondo town, SNNPR. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Teshome H (2011) Assessing the provision and management of educational infrastructures and services in Bele town, SNNPRS. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tewfik AA (2011) Analysis of public health infrastructure provision and management (the case of Jugal hospital in Harar city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tiruset K (2010) Challenges and opportunities for green infrastructure provision in Debre Markos town, Amhara region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tmuzghy BF (2009) Challenges and prospects of financing urban water supply and sanitation infrastructure in Addis Ababa city administration. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Tsegay K (2010) An assessment of water supply and service provision in Alamata town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Welancho WG (2011) Urban water management is a panacea for urban water crisis: case of Tarcha Town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wendale AA (2010) An assessment of the provision and management practice of drainage infrastructure for flood management the case of Dangila town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Werede E (2011) Comparative analysis of health care infrastructure provision and service delivery between government and private hospitals in Mekelle city administration, Tigray regional state. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wesenseged B (2011) Challenges and opportunities of financing water supply infrastructure in Mekelle city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wodaje M (2010) An assessment of alternative urban energy infra-structure: the case of biomass cooking stoves in Debre Markos town (with special reference to 'Mirt' improved stove) Amhara region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wointu H (2011) Assessing the challenges of water supply infrastructure asset management in Addis Ababa water and sewerage authority. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Workineh YB (2011) An assessment of drainage infra-structure provision and management in Injibara town. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wube LF (2011) The effects of cobblestone road project on employment creation in Arba Minch city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wubishet TK (2010) The role of biogas energy infrastructure provision in Hawassa city for saving non-renewable energy resources. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Wubiye MJ (2011) Assessment of labour—based practices in natural soil stabilization technology. The case of AA city roads construction. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yeshiemebet AT (2011) Benefits challenges and prospects of information and communication technology ICT in Addis Ababa city sector Beauros. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yeshiwas YT (2010) Assessment of labor-intensive infrastructure construction technologies in Bahir Dar city: a case of cobblestone road construction project. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yesuf H (2011) An assessment of water supply and service delivery in Dhera town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Yohannes TG (2009) Infrastructure provision for tourism industry development in Dire Dawa. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zamil A (2011) An assessment of the provision and management of storm water drainage infrastructure in the city of Harar. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zeleke AW (2011) An assessment of road infrastructure provision and management in Bishoftu town, Oromia region. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zemedkun A (2009) An assessment of road infrastructure and service provision in Dire Dawa city. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Zena KM (2011) The assessment of IT infrastructure provision and utilization for land administration and management in Bole sub-city, Addis Ababa. Unpublished master's thesis, Urban management, Ethiopian Civil Service University, Addis Ababa, Ethiopia

Chapter 5
Assessment on Research Design and Methods

Abstract Current chapter sketches the research design and methods deployed by urban infrastructure researchers in Ethiopia. Review devalues higher acceptance of cross-sectional research design at large through surveys. Additionally, descriptive statistics was applauded by majority for the primary data analysis with few exceptions who used advanced technologies such as GIS-based thematic mapping.

Keywords Cross-sectional research design · Mixed approach · GIS · Descriptive statistics · Causal loop diagram

5.1 Introduction

Research design and methods are two substantial components in a scientific research project, assessment on which is vital to determine quality of research. The first section of this chapter analyses the design of research projects and the second section deals with research methods adopted by the scholars in urban infrastructure research on Ethiopian cities.

5.2 Research Design

Designing a research project is a serious process which converts curiosity of thoughts into meaningful realities. Research design is a constant process which deals between the investigator and peers, on a paradigm or established norms of noble science. This process usually surpasses disciplinary boundaries, epistemology, or subfield (Gatrell et al. 2012). In fact, research design is the unambiguous structure within which a research project is executed and accomplished.

Although there are many types of research design, based on chosen approach, some scholars categorize these approached to qualitative, quantitative and mixed approaches (Creswell 2009). Considering this taxonomy, all of 189 reviewed research studies fall under 'mixed approach'.

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Vaus (2001) stated four comprehensive types of research design as:

- Experimental
- Longitudinal
- Cross-sectional
- Case study

All the research designs mentioned above have their pros and cons, though these can be further sub-divided into experimental and non-experimental designs. In fact, longitudinal, cross-sectional and case study research designs are non-experimental.

Same variable is measured over more than once in timescale in a longitudinal study, while there is no control group (Shah 1977).

Of the all reviewed research projects, only two have employed longitudinal study method, while the rest (a total of 187) are cross-sectional studies which are also recognized as snapshot studies. These studies can either analyse trends through indicators or they test correlational hypotheses, often with the help of huge samples (Creswell 2009). More attention is required while testing causal relationships between the variables through this design (Shadish et al. 2002) though it is preferable because of higher external validity inherent in it and its potentials on being executed with limited resources.

5.3 Research Methods

A research investigator selects a method of research on the basis of his convenience and the demands of the project.

Research methods are usually the set of procedures deployed during various stages of a research investigation including goal setting, formulation of hypothesis or research questions, treatments, variables, samples, test and measurements, and statistical analysis of data.

Most of the researchers used survey method to collect primary data with questionnaires and interviews; some of them also carried out a physical measurement for the investigated infrastructure (Dagnachew 2009). A few novel research practices are methods that are discussed further.

Reviewed research projects gestured that any sort of research investigation in the urban infrastructure and services themes demands critical thinking (see Fig. 5.1) to formulate problem-solving strategies. Critical thinking includes the following questions:

- Why these problems exist?
- Why we want to fix it?
- Why it is research worthy?
- Why the problem is there?
- Why the problem started?
- Why the problem continued?

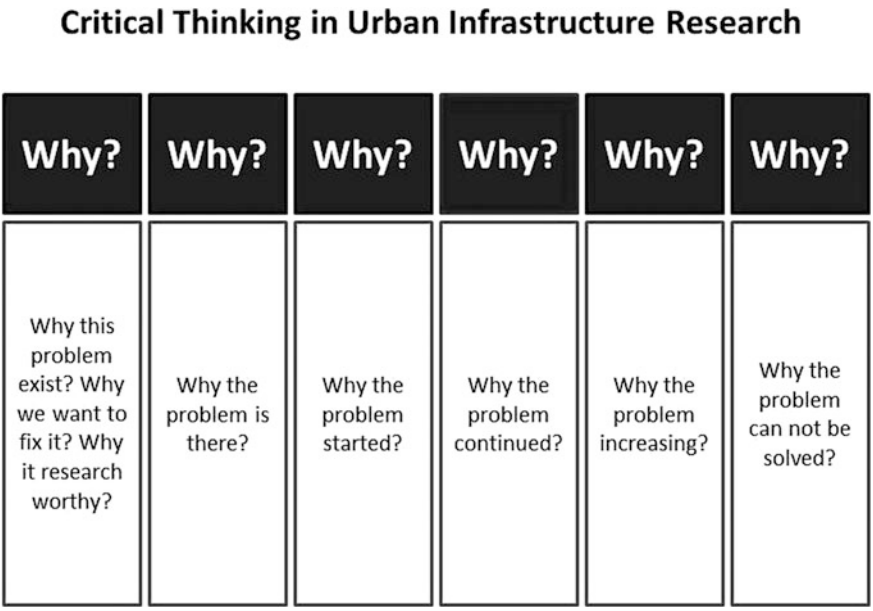

Fig. 5.1 Critical thinking in urban infrastructure research

- Why the problem increasing? and
- Why the problem cannot be solved?

Critical thinking is also a prerequisite to formulate a strategic plan for the provision of sustainable urban infrastructure (Malekpour et al. 2015).

There are many possible ways to think in a strategic manner, as Ahmed (2008) deployed causal loop diagram, CLD, method for the research inquiry, which is a tool to visualize the interrelationships among different components in a system.

Considering the method of data analysis, usually researchers preferred to use descriptive statistics; especially the percentage was the most popular measure to showcase the findings.

Regarding data presentation, pie chart was the dominating in presenting survey data while a very few researchers used thematic maps to demonstrate their results, and photographs also seem to be a prevalent medium for the presentation of data.

5.4 Conclusion

A sound research methodology is well anticipated for the scientific investigation of urban infrastructure challenges. Researchers in the reviewed projects largely used cross-sectional study approach to accomplish their research objectives. The key virtue of all projects was being based fundamentally on primary data through

surveys with the help of questionnaires and interviews. A few have shown innovations by deploying physical measurements and GIS manipulation techniques. One scholar used causal loop diagram method to apprehend complexity of the discipline. Descriptive statistics was popularly practiced for data analysis, while numerous qualitative and qualitative techniques of data presentation were deployed.

References

Ahmed MA (2008) An assessment of environmental and socio-economic impacts of improved stoves. The Case of 'Mirt' in Woldia. Unpublished master's thesis, Urban management, Ethiopian civil service university, Addis Ababa, Ethiopia

Creswell JW (2009) Research design qualitative, quantitative and mixed method approaches, Sage Publications, London

Dagnachew A (2009) An assessment of the integration between Road and Urban storm water drainage network in Addis Ababa: Addis Ketema Sub-city, Unpublished master's thesis, Urban management, Ethiopian civil service university, Addis Ababa, Ethiopia

Gatrell JD, Bierly GD, Jensen RR (2012) Research design and proposal writing in spatial science. Springer, London

Malekpour S, Brown RR, de Haan FJ (2015) Strategic planning of urban infrastructure for environmental sustainability: understanding the past to intervene for the future. Cities 46:67–75

Shadish WR, Cook TD, Campbell DT (2002) Experimental and quasi-experimental designs for generalized causal inference. Cengage Learning, Belmont

Shah VF (1977) Research design. Rachna Publication, Ahmedabad

Vaus DA (2001) Research design in social research. Sage Publication, London

Chapter 6
Summary and Conclusion

This study attempts to exhibit contemporary research investigation on urban infrastructure and services, in a number of Ethiopian cities. Infrastructure boom can be easily noticed in the key cities such as Addis Ababa, Bahir Dar, Mekelle, etc. Skyline of these cities showcases countless high-rise buildings under construction here and there.

On the contrary, the benefit of urban infrastructure boom is not legitimately distributed across all the places and communities. The scenario is prevalent, regardless of the fact that political ecology of the country witnessed remarkable positive changes, after the long monarchy and then the communist military regimes.

The things changed dramatically during the current regime which came into existence in 1991. Political stability contributed in the growth of urban infrastructure stocks, indeed, though the research findings indicate that there is still a wide gap between the demand and supply of urban infrastructure and services for the rapidly growing urban population.

Inadequate provision and management of urban environmental services is the common characteristics of urban infrastructure in Ethiopian cities as reported by the researchers. Medium and small cities are the worst hit resultant into compromised public health scenario. Provision and management deficits and gaps were reported from each and every city, which are mainly concerned to storm water drainage, water and sanitation, and sewerage system while interrupted supplies of electricity make the situation worse. Furthermore, these inadequacies could not be seen in isolation as it creates a vicious circle, and vulnerability in one infrastructure also affects other infrastructure, i.e. in the absence of storm water drainage, running water starts to overflow from open drainage or sewers and produces a heavy runoff of polluted water causing damage of property and sometime loss of lives too. Green infrastructure in the many cities lacks due attention which hampers people's health and quality of life.

Some additional observations are discoursed in the subsequent section.

The growth of Ethiopian cities is speedy, which is not impressively and exclusively tackled by the current urban master plans; in fact there is no efficient

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mechanism in place to handle these severe challenges. It is clearly visible and evident in the capital city Addis Ababa where master plans are not well implemented and enforced for regulating urban expansion; there are new urban residential developments which lack public utilities like parks and play grounds, piped water supply, interior road paving, public transportation, commercial amenities, parking, etc. Even at the centrally located, multi-storey residential buildings lack parking facilities where vehicle parking is prohibited on main road. Moreover, less attention is paid to the safety and comfort of pedestrians, while urban designing is very slightly applied in the place making. In brief infrastructure planning is not well integrated in regulatory urban master plans.

Moreover, sustainability assessments have not been carried out for urban infrastructure and building construction; hence, their durability is suspicious. Probably, immediate demand of housing and infrastructure darkened the quality aspect and centre of the focus moved only towards the quantity. In Addis Ababa, personal experience of the author, regarding sanitary and plumbing fitting and plumbing fixtures, was quite disappointing as they needed to be replaced repeatedly while in shorter durations and leads to the wastage of resources. Author enquired about LCA (Life Cycle Assessment) at many under construction sites of urban infrastructures and the response was not promising. The fact is also tragic that design and construction standard in the most buildings was of lower quality. Although the current cost of infrastructure and building construction is lower, but as their environmental performance has been compromised, they are going to be expensive because of higher costs of repairs, maintenance and even replacement in many cases.

Additionally, urban informal sector in Ethiopian cities is faced with continuous ignorance by officials whilst they offer many urban infrastructure services either occasionally or regularly; during the failure of water supply in Addis Ababa city, the service is guaranteed by small independent service providers who are basically from informal sector—basically the immigrants from rural Ethiopia; their role in offering services in many phases of solid waste management like door-to-door collection, sorting, transportation and reuse is also remarkable. Therefore, informal sector can be understood as a saviour when the urban infrastructure and services are disrupted. Despite of the remarkable contribution by the informal sector, they are not well appreciated by the urban policy and decision makers as there are no appropriate regulations to do so.

Furthermore, none of the researchers considered market-based financing of urban infrastructure which is successfully executed in many developing countries.

Finally, the significance of this review is to determine agenda of future research studies dealing with urban infrastructure and services in Ethiopian cities. Under this research agenda universities, private sector and government should work together in collaboration for knowledge co-creation and produce meaningful solutions thereafter.

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