Future Proofing Cities

Ethiopia - Regional Cities

ARUP

Cities Alliance
Cities Without Slums

Foreword

It is a great pleasure to introduce these Future-Proofing Cities Studies, covering cities in Ethiopia, Ghana, Mozambique and Uganda. These studies, form an integral part of the Future Cities Africa (FCA) Programme that the Cities Alliance has undertaken over the past two years, with financial support of DFID. These studies covered nine cities that were carefully selected to represent metropolitan cities, secondary cities, regional capitals and cities within growth corridors. Together, they exemplify the challenges of contemporary rapid urban growth, and the opportunities and promise that African cities can and must hold for the future of the continent.

While demonstrating important differences between the cities, there is a common thread that is well understood by national governments and city managers alike: a combination of enabling national policies, strong institutions, well-resourced and accountable local governments, and informed and engaged citizens are essential for local and national prosperity. On the African continent it is precisely these type of cities, in every country, that will have to be empowered to contribute to the successful implementation of Agenda 2030, and grapple with the consequences of climate change. However, time is very short, as the majority of urban growth is determined more by facts on the ground than by effective policy-making.

I would like to thank Jamie Simpson, Erika Puspa and the entire FCA team for their outstanding work in completing a complex work programme against demanding deadlines, our colleagues at Arup International Development for the high quality of these studies, and Simon Ratcliffe and his colleagues at DFID (UK) for their constant support and encouragement.

William Cobbett

Cities Alliance Director

Ethiopia – Regional Cities is part of the Future Cities Africa (FCA) initiative in partnership with Cities Alliance and the UK Department for International Development (DFID).

FCA is a partnership initiative launched by Cities Alliance and DFID to support cities in Ghana, Ethiopia, Uganda and Mozambique as they transform themselves into resilient, inclusive centres of economic growth.

Acknowledgements

This report has been developed by Arup in collaboration with Cities Alliance as part of Department for International Development's Future Cities Africa programme. We would like to thank the Future Cities Africa team and the wide range of stakeholders we consulted in Ethiopia for making time to contribute to this study. Also, we wish to recognise the valuable guidance and feedback we've received from the Cities Alliance team on our findings and how best to communicate them.

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African governments are counting on urbanisation to lift their nations out of poverty.

Figure 1. Street in Mekele

Introduction

The majority of Africa's population will shift from rural to urban in the next thirty years. Future Cities Africa aims to help cities achieve inclusive economic growth, manage demographic change, and address environmental risks.

Africa is going through an economic boom and cities are at the centre of this pathway to economic prosperity. Two key features are set to alter Africa's future: a youthful population and urbanisation. Combined, these features are defining the boom in trade and industry and will push modernisation and increase connectivity across the continent (KPMG, 2012).

Africa's cities are emerging as centres of entrepreneurship, innovation, creativity and invention. Africa is now the fastest-growing region in the world in terms of mobile telephone and internet access. It is anticipated that mobile data usage will increase twenty times between 2013 and 2019 (Ericsson, 2014). Africa is also the final inhabited continent on the planet to urbanise.

Globally, future city growth will be almost exclusively in Africa and Asia, representing over 90% of the world's urban population growth (WEF, 2015). In its recent report, *Future of African Cities: Poles of Prosperity or Slums of Despair* (2015), the Brenthurst Foundation indicates that by mid-2030 half of all Africans will live in cities. They suggest that three main drivers of African urbanisation are fuelling these historic changes in the continent: natural population growth, rural-urban migration, and large-scale dynamics such as connectivity, technology and globalisation (Brenthurst Foundation, 2015). Linked to these drivers of growth, greenhouse gas emissions in the region are expected to grow rapidly, primarily through increased fossil fuel use, and agricultural expansion (Hogarth et al, 2015).

"The emerging future of cities largely depends on the way we plan and manage urbanisation, and the way we leverage this transformative process to 'provide the setting, the underlying base and also the momentum for global change"

Joan Clos
Executive Director UN-Habitat

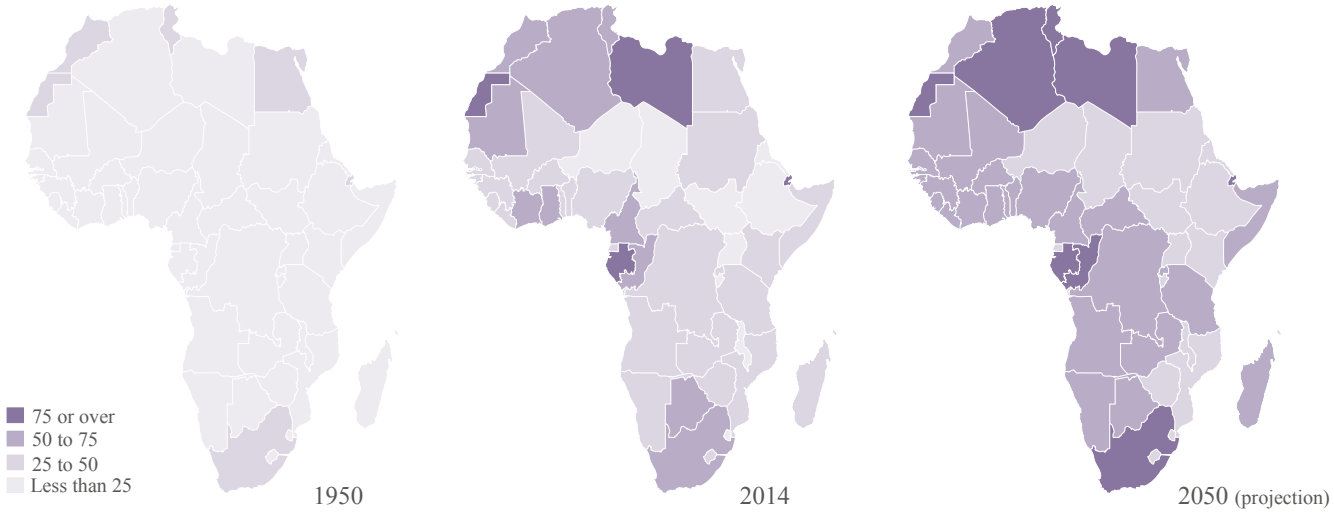


Figure 2. Percentage of the population residing in urban areas
Based on World Urbanization Prospects, The 2014 Revision. UN 2015

African city megatrends

Development megatrends impacting African cities can be viewed as opportunities or risks depending on a city's context.

Figure 3: African city megatrends - highlighting Ethiopian megatrends
based on Z-punkt, n.d. & Arup Cities Alive, 2014

"The current wave of urban growth in Africa is occurring faster and on a larger scale than anything the world has yet witnessed, and therefore poses the greatest challenge yet for urban and national policy-makers."

Brenthurst Foundation, 2015

The challenge facing African cities is to provide their citizens with equal economic opportunities while transitioning to a low carbon economy, using limited resources efficiently, and managing rapid urban and population growth. African cities also need to manage the impacts of a youthful population. In Uganda, for example, the majority population is younger than 15. This leads African leaders to question whether their demographic profile is an economic godsend or ticking time-bomb (World Bank, 2012).

For African cities to be successful they should adopt integrated and holistic urban planning practices that consider not only inclusive economic development and low-carbon development pathways but also the environmental and social impacts of growth to promote liveable cities. Cities need to plan for growth that is future-proofed for our changing climate, the challenges of scarce natural resources, and underlying geophysical risks.

This report relates to urbanisation as it is currently happening in Ethiopia. It captures the present situation of cities and also the government's planned urbanisation strategy.

The report discusses how Ethiopia plans to transition from a nation with one of the lowest urban populations in the world - just over 17% - to a majority urban and middle-income nation in 2025. Some estimates indicate that Ethiopia's urban population will increase three times in the next 20+ years, achieving an extreme urban growth rate of over 5% per year. This report will also discuss the impact the urbanisation strategy is having on the regional development of the country. To discuss these messages, Future Cities Africa has selected two cities, Mekele and Dire Dawa, to indicate the current urbanisation trends and to highlight key challenges these cities may face in the future.

This report relates to regional capitals in Ethiopia and represents one of four reports prepared for Future Cities Africa. Each report covers a specific country, its national urbanisation strategy and its specific regional planning typology. The other three reports include: metropolitan cities in Ghana, secondary cities in Uganda, and urban growth corridors in Mozambique.

Figure 4. Light rail service in Addis Ababa
Credits: natamariam/photobucket

Approach

Future Cities Africa seeks to support cities in Africa to become future-proofed for climate, environment and natural resource challenges, so that they are inclusive and resilient, and have growing economies. It will help make cities work for the urban poor. It will conduct an in depth feasibility and scoping study and develop innovative tools to enable rapidly growing African cities to realise their potential as centres of growth and job creation; and use research and evidence to develop targeted urban action plans.

Future Cities Africa Business Case and Intervention Summary (DFID, 2014)

Future Cities Africa is working with Sub-Saharan (SSA) cities to future-proof them for the range of social, economic, and environmental risks they are exposed to now and will be exposed to in the future. As discussed above, African cities are experiencing rapid population growth and urbanisation alongside a range of severe environmental shocks and stresses. City governments in Africa tend to have limited institutional capacity, over-stretched financial and human resources, and limited data to guide decision-making. Future Cities Africa has identified three key drivers (see Fig. 5) that are shaping African cities: achieving inclusive economic growth, managing demographic change, and addressing local risks associated with climate change, natural resources, and geophysical risks.

Figure 5: Future Cities Africa drivers

Arup was asked to prepare Future-Proofing City Studies for nine cities in four countries: Mekele and Dire Dawa (Ethiopia); Accra and Tema (Ghana); Tete, Nampula, and Nacala (Mozambique); and Jinja and Arua (Uganda).

These studies are part of an in-depth feasibility and scoping phase to develop diagnostic tools to enable these cities to realise their growth potential and begin to guide this growth toward a more resilient and inclusive future. We hope that these city studies will help practitioners in local municipalities, national administrations, and international organisations better understand the specific challenges each city is facing.

Two tools are used as part of our data analysis to help us dig-deeper into the capacity to act and risks in the cities - the Cities Alliance Normative Framework and the Arup Environmental Risk Framework.

Normative Framework

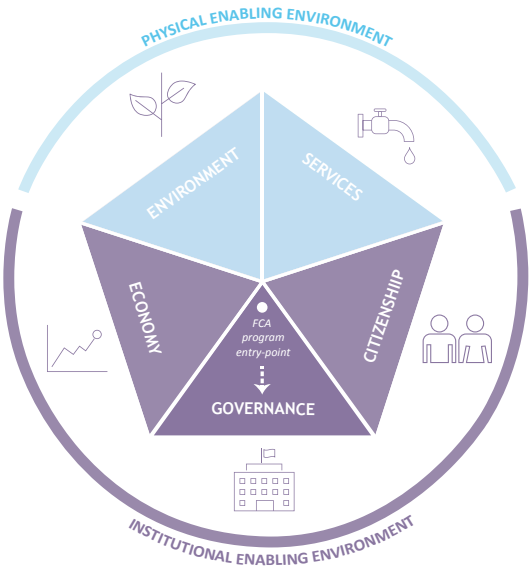


Figure 6: Normative Framework

The Normative Framework describes the physical and institutional environment which can support cities to achieve inclusive economic growth, to manage demographic change and to future-proof against environmental risks. The Framework helps: identify relevant data sources, facilitate discussions and build understanding of the factors that African cities need to 'get right' to achieve inclusive growth, manage demographic change, and address future risk. The Framework is a tool to assess the physical and institutional enabling environment within African cities, and provides an evidence base for future planning, investment and decision-making. As part of this work, the Framework mapped the available information for each city and to provide an holistic understanding of each city's assets according to the five dimensions of the Framework.

Urban ER

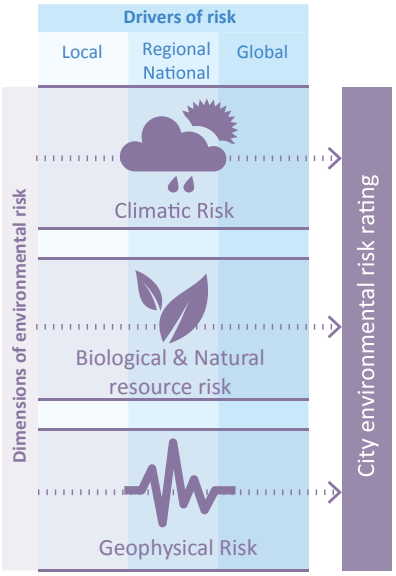
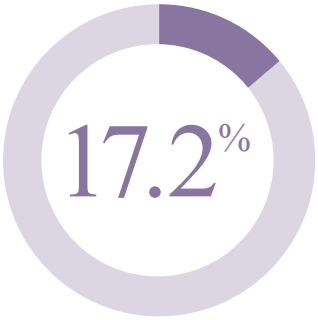


Figure 7: Urban ER

Arup has developed an Urban Environmental Risk Framework (Urban ER) in order to help cities to understand and address the critical environmental challenges which shape urban wellbeing. The Framework identifies three dimensions of environmental risk for African cities: climatic, biological, and natural resource and geophysical hazards. A current risk rating is provided through an understanding of existing threats. A future risk rating is provided based on the drivers of risk at three scales: local (such as loss of local biodiversity), regional (such as poor regional planning policy), and global (such as climate change). Through understanding the drivers of environmental risk, we can help city governments, advisors and stakeholders understand how local urban development pathways can create or compound risk. Urban ER can also help cities evaluate their capacity to act at different levels in order to mitigate current risk, and collaborate with others on a local, regional and global level to achieve a more resilient future.

Ethiopia



of Ethiopians
live in urban areas

Ethiopia currently has low levels of urbanisation and a predominantly agricultural economy. However the country is rapidly urbanising and one of the fastest-growing economies on the continent.

Ethiopia is Africa's oldest independent country and its second most populous, with a population of 90 million (UNDP, 2015). The country has a unique history and cultural heritage. Ethiopia has never been colonised, aside from a five-year Italian occupation in 1936-1941. Unlike other African countries where mining was a primary reason for colonisation (Bekele, 2016), Ethiopia still has a wealth of unexploited minerals and limited geological information linked to its unique history. A military regime known as the Derg, ruled Ethiopia Between 1974 and 1991. Opposition to the Derg led to the Ethiopian Civil War. The war ended in 1991 as the Ethiopian People's Revolutionary Democratic Front, a coalition of ethnic-based rebel groups overthrew the military government and unified the country. Ethiopia experienced dramatic political change after the military regime was defeated. The country introduced the principle of ethnic self-determination and decentralised organisation under a system of federal governance.

Currently, Ethiopia is experiencing rapid urbanisation and remarkable economic growth with a 10.3% growth rate in GDP recorded in 2013/14 (ADB, 2015). Ethiopia has a vision of becoming a middle-income country by 2025. The poverty rate has already decreased from 39% in 2004/5 to 26% in 2012/13, and there has been a 53% increase in its absolute Human Development Index (HDI) since 2000 (Cities Alliance, 2015).

Figure 8: Addis Ababa
Credit: OER Africa/Flickr

Ethiopia at a glance

Economic growth in 2013- 2014

10.3%

Ethiopia is one of fastest growing economies in Africa

Poverty rate

Decreased from

39% → **26%**

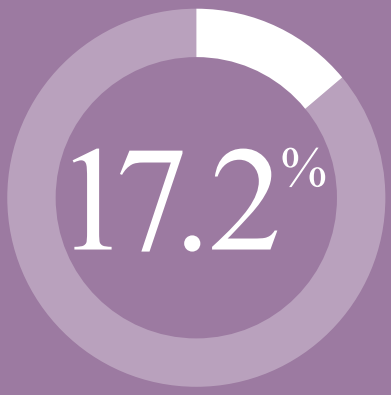
2004/2005 — 2012/2013

The poverty rate has decreased drastically in the last 10 years

Employment

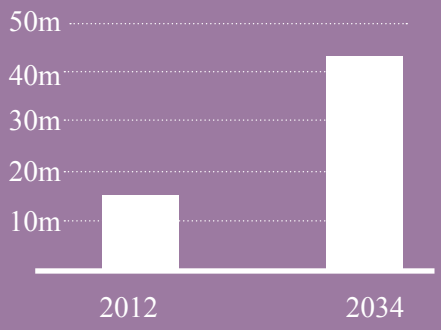
85% of the population is **employed in agriculture**

Low proportion of urban population



In 2012, **15.2m out of 90m people lived in urban areas** - one of lowest in the world & below SSA average of 37%

Urban population set to dramatically grow



The country's urban population is projected to increase from 15.2m in 2012 to 42.3m by 2037, **an annual growth rate of 3.8%**

Figure 9: Ethiopia Infographic

In recent years, the government has made major investments in economic and social infrastructure. Pro-poor spending increased from 28% in 2000 to 70% today; and education provision has expanded extensively at all levels.

However, as retention rates show, quality of education is still lacking in some areas and healthcare is still weak, particularly in terms of maternal health. The country's tax take-to-GDP ratio remains low at 12.5% in 2012/13 compared with the SSA average of over 20%. This shows that despite significant absolute gains in HDI, inclusive growth and development are occurring only slowly. The country has not moved appreciably in its relative HDI ranking since 2000. It remains at 173 out of 186 countries in the latest UNDP Human Development Report (UNDP, 2015).

Its economy is strongly based on agriculture, which employs 85% of the population. The dependence on agriculture leaves the economy vulnerable to environmental challenges, particularly droughts and flooding. However now that the conflict with its northern neighbour, Eritrea, has ended, foreign investment is flowing in and there are many economic areas of opportunity. In 2014 Ethiopia's inward foreign direct investment (FDI) was $1.2 billion, up from $953 million in the previous year, and $279 million the year before that (UNCTAD, 2015). The recently released Growth and Transformation Plan II aims to achieve middle-income status through enhancing productivity in manufacturing and agriculture while also improving quality of production and stimulating competition in the economy (Federal Democratic Republic of Ethiopia, 2016). Key industries that will be supported in this planned industrialisation process include textiles and garments, agro-processing (including floriculture and sugar factories) and mineral extraction and processing. The country's strong system of governance, relatively low corruption and diversifying economy suggest that this goal is achievable.

To reach the national vision and sustain "rapid, broad-based and equitable economic growth and development", cities will be key. Currently the urban population is growing at an estimated 5.4%. This is set to triple from 15.2 million in 2012 to 42.3 million in 2037 (World Bank, 2015). To support the planned industrial growth, national policy includes plans for industrial estates, special economic zones and agro-processing centres. To move Ethiopia to middle-income status, the federal government is investing in industry and regional cities. For national growth to maintain social harmony and address regional inequalities, development must be spread across the country and therefore across cities in all regions.

The following section describes the national urbanisation strategy as it relates to regional cities in Ethiopia. This strategy will be illustrated through two city studies for Mekele and Dire Dawa.

Regional cities

Ethiopia's regional cities have a relatively high level of political autonomy, prioritised around urban 'clusters' of cities of a million-plus people with smaller urban centres nearby, and 'growth poles' along transport corridors. This is to achieve balanced growth in the goal of becoming a middle-income country.

Figure 10: View of Mekele
Credit: Kris Fricke/Flickr

High economic growth

With an average annual **GDP growth rate of 10.8%**, Ethiopia is one of Africa's fastest growing economies.

A key characteristic of cities in Ethiopia is the ten-fold difference in size between the capital, Addis Ababa – at over three million and other cities. The largest secondary cities are spread across the country, with most in the northern half of the country.

Ethiopia's recent Growth and Transformation Plan II (GTPII) includes plans to attract investment to cities beyond Addis Ababa by finalising ongoing transportation development and establishing industrial parks, and linking Addis Ababa to dry and sea ports. The Ministry of Urban Development and Housing (MUDHo) has taken strong leadership on this investment strategy, having undertaken a process to prioritise cities for future development. The prioritisation is based on plans for 'clusters' of urban economic centres, with improved connectivity using key transportation corridors or 'growth poles'. This will allow major agglomeration effects to enable the country to reach its goal of middle-income status. The plan for economic corridors, based on regional city clusters and significantly improved inter-regional transport connectivity, aims to achieve balanced development of secondary cities and their rural hinterlands (Fig. 13).

This plan for urban clusters will function within Ethiopia's decentralised system of relative regional autonomy. Ethiopia has decentralised administration to the regions to encourage more consistent growth across the country. Regional city proclamations have given cities wider remits for service delivery, which include state functions and municipal functions (such as locally managed waste management).

Despite its large population, Ethiopia has the lowest proportion of people currently living in cities. However, this is quickly changing with an urbanisation rate of around 5% per year (MUDHCo, 2015a). This could mean that in 2035, 37 to 40% of the national population will be living in cities. The ten-fold gap in scale between the capital Addis Ababa, and the next largest urban centre characterises Ethiopia's urbanisation (The New Climate Economy, 2014) (Fig. 11).

This situation presents both a key challenge and opportunity for Ethiopia. Relatively small, rapidly growing cities are experiencing a number of challenges but are 'young' enough to implement urbanisation plans that could enable sustainable development.

Cities in Ethiopia are still largely market centres, where the greatest proportion of employment comes from wholesale and retail trade. This is beginning to change as new investment is focused on increasing economic opportunity in the cities to meet the demands of the growing population and address high levels of unemployment. Construction and manufacturing industries is driving current investment in cities. Other industries that will benefit from regional connections are tourism, mining and livestock. However, poor connectivity within each region and the differences between rural and urban access to resources limits how effectively cities are

Market centres with poor regional connections

While industries such as tourism and mining are strengthening regional connections, **outside the capitals transport is poor**

Urbanisation trade-offs

Urbanisation is helping to deliver services to more concentrated populations, but it is also **putting pressure on limited natural resources**

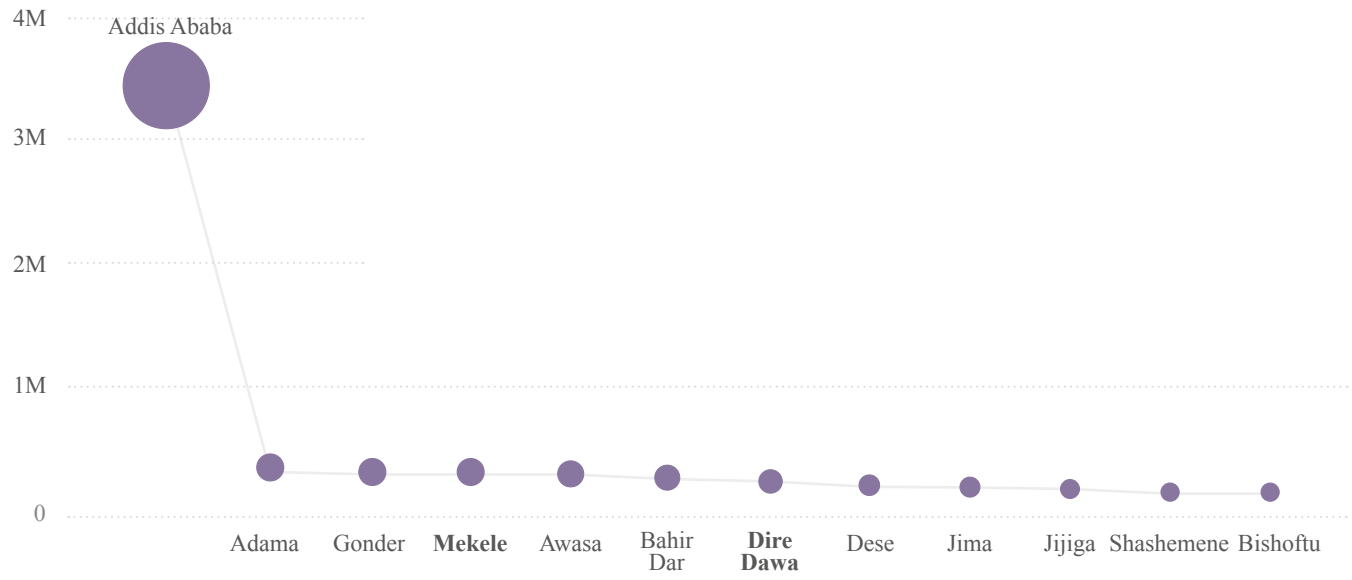


Figure 11: Most populated cities in Ethiopia

able to benefit from their regional resources. Outside the regional capitals, transport infrastructure is very poor, restricting the movement of perishable goods, and access to basic services such as electricity and water in limited.

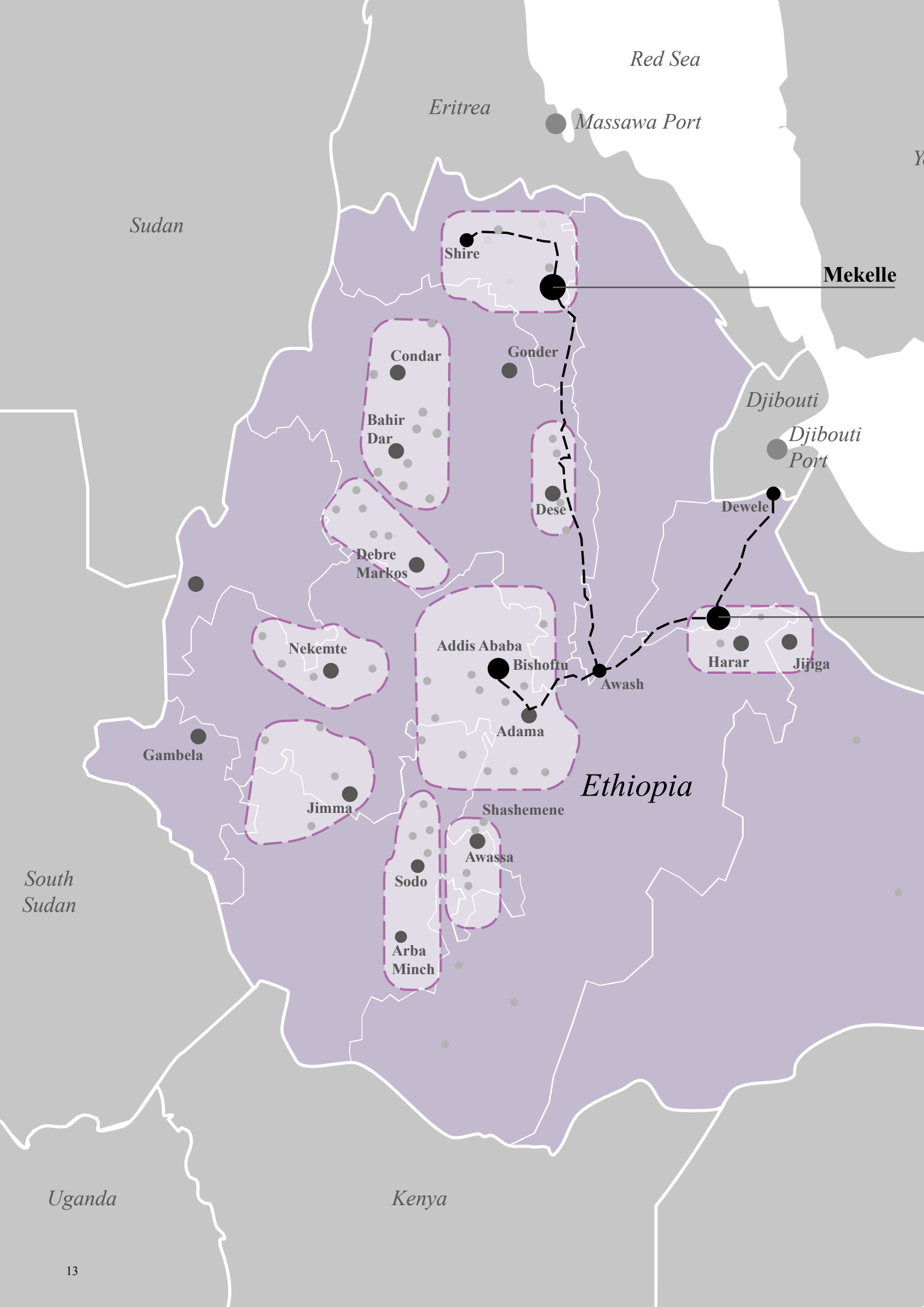
While Ethiopia's urbanisation strategies match national economic growth plans, there is arguably a disconnect with the availability of natural resources to satisfy cities' growing populations and industrial ambitions. Cities have undertaken service delivery improvements and adopted various types of management tools such as strategic planning and management (SPM) and business process re-engineering (BPR), as part of the national civil service reform program. While there are clear signs of economic growth, cities are struggling to cope with the demands of urbanisation, environmental stresses and poverty alleviation. To illustrate the current level of informal settlements almost matches the level of population growth, a clear signal that the cities are not coping with the increasing demand for new housing.

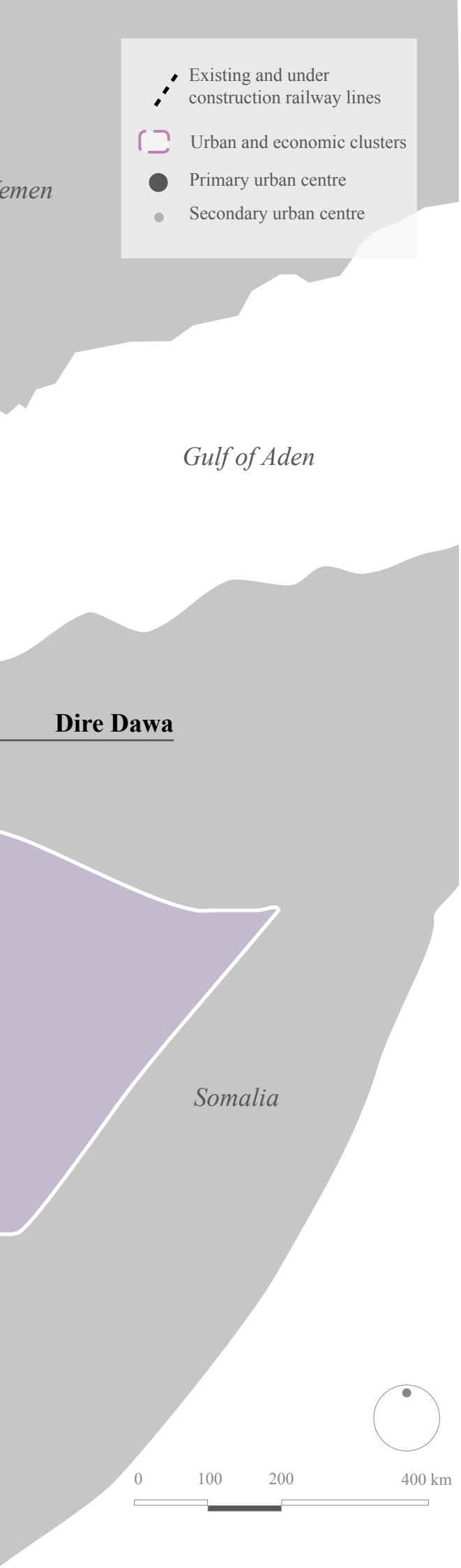
Ethiopia has an added unusual characteristic from many other developing countries in the quality of urban growth: there is not always a direct relationship between the informality of settlements and poor quality of housing and/or service provision in a neighbourhood. In some cases informal settlements have higher quality housing and are better serviced than legally planned settlements. In cities such as Addis Ababa for example some 'illegal' settlements are not sub-standard and are connected to basic services (World Bank, 2004). On the other hand other legal settlements which are usually managed by local governments would be classified as informal given that they are in unplanned neighbourhoods and lack access to basic services (MUDHCo & ECSU, 2015).

Meanwhile, environmentally, issues of ecosystem dependency are largely overlooked in current planning and policies. For example, Mekele is dependent on the limited capacity of the Aynalen Wells Aquifer, which is currently at risk of chronic drought and over extraction (Amdework, 2016) and is slowly being depleted (Future Cities Africa, 2015). Plans for augmenting supply to meet future demands have not been made.

There is therefore a genuine opportunity for Ethiopian cities to invest proactively in systems and planning that anticipate urban development trends and avert some of the consequences of rapidly growing cities that other countries are experiencing.

Figure 12: Mekele Shops
Credits: Mariusz Kluzniak/Flickr


Red Sea
Eritrea
Massawa Port
Sudan
Shire
Mekelle
Condar
Gonder
Djibouti
Djibouti Port
Bahir Dar
Dese
Dewele
Debre Markos
Nekemte
Addis Ababa
Bishoftu
Harar
Jijiga
Awash
Adama
Gambela
Ethiopia
Jimma
Shashemene
Awassa
South Sudan
Sodo
Arba Minch
Uganda
Kenya



Mekele

Mekele, described as the 'Star of the North', is a steadily expanding city of 300,000 inhabitants in a region of 5 million inhabitants. It is a historic trading centre with potential for greater international reach. The limited capacity of the local aquifer is resulting in a severe water crisis in the city.

Dire Dawa

Dire Dawa is the only city other than Addis to have "chartered city" status. While it is not a regional capital, it is considered a Regional City given its political importance between different ethnic regions. Dire Dawa has the same level of autonomy as that given to the states – it is free to make its own decisions subject to the constitution and Federal government. However, because it is unable to draw resources from a region, the city is at risk of becoming less important and having to compete with its neighbours.

Figure 13: Map of Ethiopia with urban and economic clusters

Mekele

Mekele has been held back for years because of the conflict with Eritrea. Given its good connections for trade and transport, it is now set to grow.

of households in Mekele use electricity for cooking, up from 5% in less than a decade

Known as the 'Star of the North', Mekele City was founded in the 13th Century. It was the capital of Ethiopia in the 1870s. Today it is a vibrant hub of culture, industry and education. Historically, the city served as a market town. Camel caravans brought salt to trade from the volcanic lakes to the East. The area is of great historical interest, serving as the gateway to the World Heritage Sites of Axum and its rock-hewn churches. A number of attractive landmarks feature in the city, including a civil war monument, three castles, six churches and the largest salt market in Ethiopia.

As the capital of the Tigray region in the north of the country, Mekele is the largest city in northern Ethiopia and the second most populous in Ethiopia estimated at 341,000 in 2016 (CSA, 2013). The city sits at an elevation of 2000m with relatively high temperatures and evenly distributed rainfall throughout the year. The largest ethnic group is Tigray (96%) the majority of whom are reportedly Orthodox Christians (93%) (MUHDCo, 2015b).

Culturally, Mekele benefits from a number of heritage sites nearby which offer great tourism potential. With the highest number of educational facilities after Addis Ababa, the city has a growing knowledge hub. This is a source of direct economic opportunity as well as capacity for the region. Mekele is home to many higher education institutions such as Mekele University and Mekele Institute of Technology as well as 94 schools (79 for grades 1-8 and 15 for grade 11-12).

The city is connected though a new international airport, an international railway network primarily for freight, frequent intercity bus services and has a mostly paved road network (85%). The city has good healthcare and educational service coverage. Health extension workers are now providing door-to-door healthcare. The population-to-hospital ratio is 1:95,500 compared to the average 1:176,600 for major cities in Ethiopia. Electricity usage in the city has dramatically increased in recent years (from 5% in 2007 to 40% now used for cooking) (Cities Alliance, 2015).

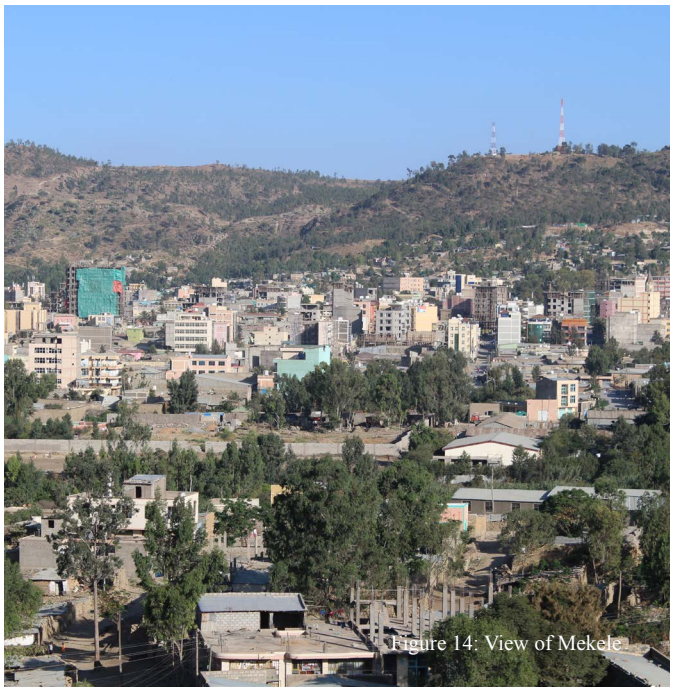


Figure 14: View of Mekele

Figure 15: Tigraian people's liberation monument
Credit: doctigray.wordpress.com

Mekele in numbers

Citizenship

93%
Voters in 2005 election

66.8%
Net school enrolment rate age 4-6

6.2%
Population growth rate
1994-2007

Economy

69 SMEs
per 1000 people
2000 - 2006

40%
Youth unemployment rate

Governance

23.5
municipal employees/1000 residents

$233
Per capita
expenditure in 2006

$73
Per capita revenue
in 2006

Services

85%
Paved roads

25%
Leakage of water pipelines

3.5%
City area relative to
informal settlements

40%
Households have
two to three power
interruption / week

Environment

Households using electricity for cooking

2007 5%

2015 40%

8 - fold growth in eight years

Figure 16: Mekele Infographic

The city is strategically located close to various resources and is connected to other parts of the country and to an international shipping port in neighbouring Eretria. The city's economy relies on wholesale and retail trade, with growing investment in the construction and service industries. A rich source of limestone from the surrounding region also supplies a number of cement factories in the city. Ethiopia's principal cement factory is located in the city, along with steel industries. The favourable climatic conditions and land availability make horticulture, floriculture, and cattle attractive business opportunities too.

As a key regional capital in Ethiopia's growth and development plan, Mekele has implemented land use and strategic plans and is experiencing economic activity with many medium to small enterprises. The city has a relatively high per capita revenue but not as many employees per capita as compared with Dire Dawa. Mekele has expanded in land-take, by 350ha in 2013 (from 540ha). However despite steady economic growth, unemployment and the proportion of informal settlements remains high. Many areas lack reliable sewerage, water and electricity services. Households still rely on other fuels for their energy needs and inadequate waste management and sewerage is contributing to severe health and environmental issues. A critical water services shortage exists in the city with an overall network coverage of 67%, though a quarter of all network water is lost to leakage and challenges over payments for services (of those serviced, 30% are not billed and 25% do not pay).

Figure 17: Street in Mekele

What is shaping the city?

New growth areas on the edge of Mekele

The federal Ministry of Industry is joining hands with private investors to establish special zones for economic development outside the city boundaries. These zones are being set aside for economic activity, industry, and housing outside the current city and as a result are outside the administrative responsibility of Mekele. These zones are vast in size compared with the current city area. Key industries such as textile manufacturing are being attracted to the area. Increasing manufacturing in the city is increasing the wealth of the city and is providing much-needed jobs. The city is not planning for new growth in industry and population, raising concerns over the resilience of the city's water supply, waste management operations, and supply of affordable housing. The city may become responsible for new growth areas in the future. It is important for plans to be in place to ensure it has the capacity to service these new areas.

Strategic location and the legacy of peace

Mekele has been a vibrant market town since the 13th century thanks to its strategic position along key trade routes linking inland regions with the commercial ports on the Red Sea in Eritrea. Salt has been traded in Mekele for centuries: it once held the largest salt market in Ethiopia. Conflict in the recent past has shaped the development of Mekele and the Tigray region generally, limiting business opportunities and affecting government investment in the city. The current peace with Eritrea has attracted an increase in domestic and foreign investment.

Urban management improvements are being implemented, including the recent Mekele Structural Plan (2014), which sets out clear goals and strategies as well as a spatial analysis. Service provision is also improving. Public consultation and community engagement is steadily improving and the public is now becoming more involved. New citizen groups are emerging to take ownership over their own development. The contemporary city is building on its historical trade roots and is now the capital for cement and steel production in the region. The city is home to the second busiest international airport in Ethiopia, an international railway under construction and good roads connect the city to various parts of the country. These good transport connections have helped Mekele become a thriving business hub supported with significant human resource capacity and many educational institutions in the city.

Figure 18: Street market in Mekele. Credit: BBC World Service/Flickr

Figure 19: New industry on the outskirts of Mekele

Importance of geography and environmental management

Mekele's geography has influenced its past and will continue to shape its future. Mekele is located in the geologically active Rift Valley in temperate highlands at 2000m above sea level. The city lies within a tropical savannah climatic zone, meaning average temperatures are always above 18°C and average amount of rainfall (just over 700mm/year). The city is exposed to natural hazards such as flooding, droughts and earthquakes. Mekele's future will be defined by its ability to manage scarce natural resources. The city accesses its water from finite underground aquifers and, as mentioned previously, these are not adequate for the city's needs. Residents in the city are linking an increase in high winds in the city to deforestation, which is also leading to soil erosion. Air pollution is also an increasing concern with the rise of industrial investment in the area.

High demand for basic services

The city's economic growth has been steady in recent years but unemployment remains high. Special economic zones are providing some employment but are also attracting even more people to move to Mekele, so the net impact on overall unemployment is not as significant.

The lack of basic infrastructure remains a key issue shaping Mekele. Housing is a significant issue and the proportion of informal settlements remains high. Electricity is available to the majority of inhabitants but is both unaffordable and unreliable. Households continue to rely on other fuels for their energy needs. Unreliable energy also threatens economic growth in Ethiopia, as a study of residential energy consumption and GDP between 1970 and 2011 has shown (Guta et al. 2015).

Waste management is a particular concern. The city lacks a sewerage system. This situation is leading to severe health and environmental issues for the city and threatens the economic and environmental future of Mekele. For example, inadequate waste management systems in the city leave its water supply at risk of pollution. Inappropriate waste disposal, such as Household waste being burned in open pits, is also believed to be affecting the city's air quality (Cities Alliance, 2016a).

Figure 20: Services under construction in Mekele

Figure 21: Messebo Cement Factory, Mekele
Image credit: www.atec-ltd.com

Key Themes

Citizenship

Conflict with Eritrea
The conflict with Eritrea that lasted until 2000 disrupted the local population and social cohesion.

Lack of consultation in planning
Insufficient consultation in planning – citizen groups are present but relatively new.

Sense of ownership
Despite the relatively recent conflict and lack of participation, there is no legacy of colonialism and so the population should be more naturally engaged and still have a sense of ownership.

Economy

Impact of conflicts
The conflict with Eritrea also meant that the region underperformed economically.

Business hub
The city is a centre of trade and industry with proximity to Port Sudan, the international airport and presence of medium and large industries.

Opportunities to develop industries
There are many opportunities with local industry (e.g. steel & cement) and notably the Mekele-Awash railway that will bring economic development.

Governance

Clear governance structure
As the capital of the region, governance is clear with decentralised power.

Good land use planning
Good policy is in place including a recent city structural plan including future land use maps, and a detailed neighbourhood development plan for the Gergembes Development.

Implementation issues
Implementation of urban and strategic plans is proving difficult.

Services

Good social services
The city has good healthcare and education with better than average population-to-hospital ratio and many higher education facilities such as Mekele University.

Lack of civic infrastructure
Inadequate sewerage system, unreliable energy and water (groundwater) supply is under threat.

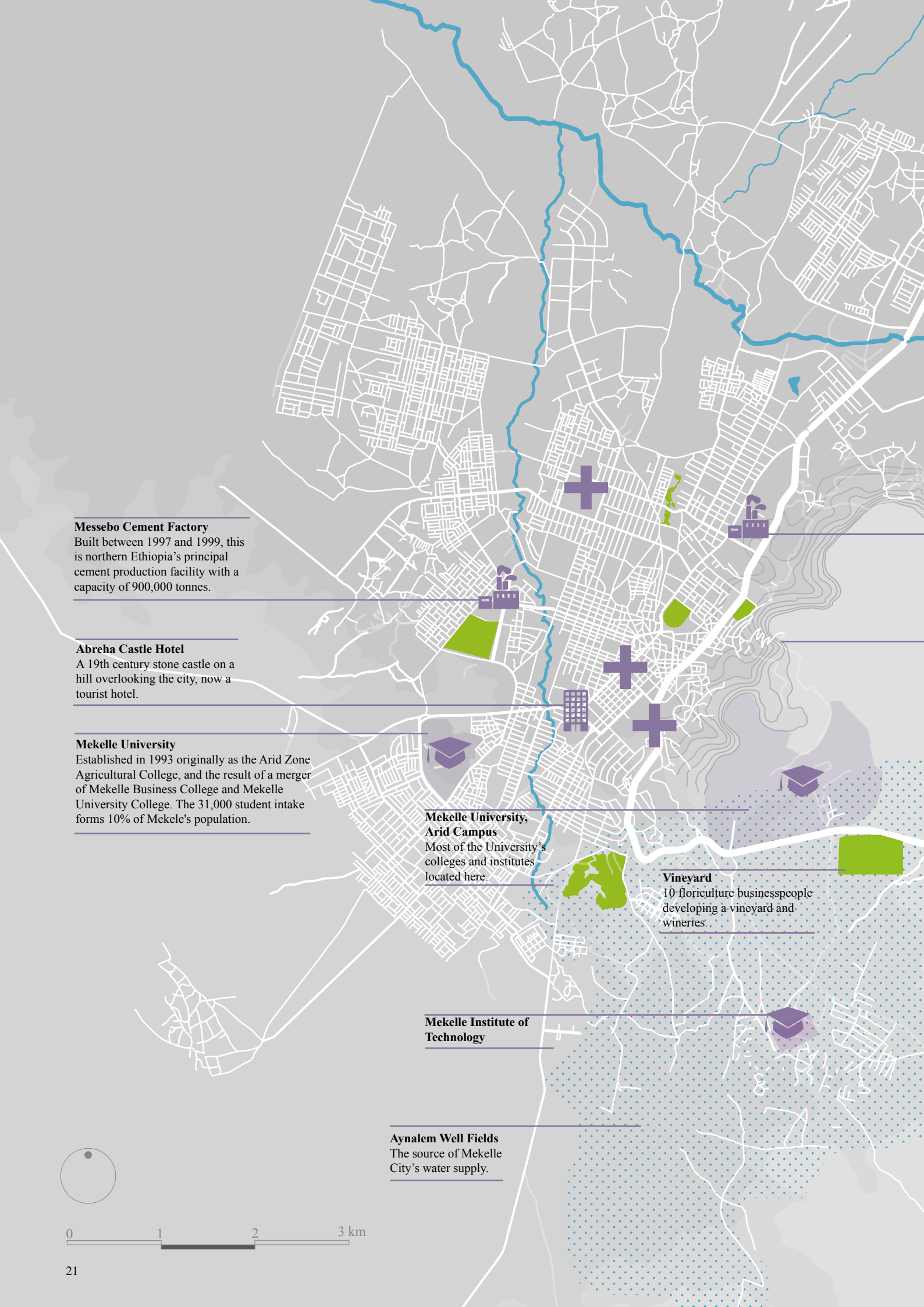
Waste management
Waste management is a key issue: households burn or bury their waste in their compound. The city also lacks liquid waste disposal systems.

Environment

Lack of ecosystem protection
City expansion and lack of ecosystem protection has led to loss of green space within the city and deforestation in the surroundings. In new plans (e.g. Gergembes) no functional recreation space has been provided for.

Industrial pollution
Industrial pollution from large factories is reducing air quality. Indoor air pollution in households is a problem in the city with wood, dung and charcoal still used as fuels.

Lack of alternate water sources
The acquifer is a good water source but the city supply is entirely dependent on these underground sources. During the dry season, the water supply is rationed on a shift basis.


Messebo Cement Factory
Built between 1997 and 1999, this is northern Ethiopia's principal cement production facility with a capacity of 900,000 tonnes.
Abreha Castle Hotel
A 19th century stone castle on a hill overlooking the city, now a tourist hotel.
Mekelle University
Established in 1993 originally as the Arid Zone Agricultural College, and the result of a merger of Mekelle Business College and Mekelle University College. The 31,000 student intake forms 10% of Mekele's population.
Mekelle University, Arid Campus
Most of the University's colleges and institutes located here.
Vineyard
10 floriculture businesspeople developing a vineyard and wineries.
Mekelle Institute of Technology
Aynalem Well Fields
The source of Mekelle City's water supply.
0
1
2
3 km

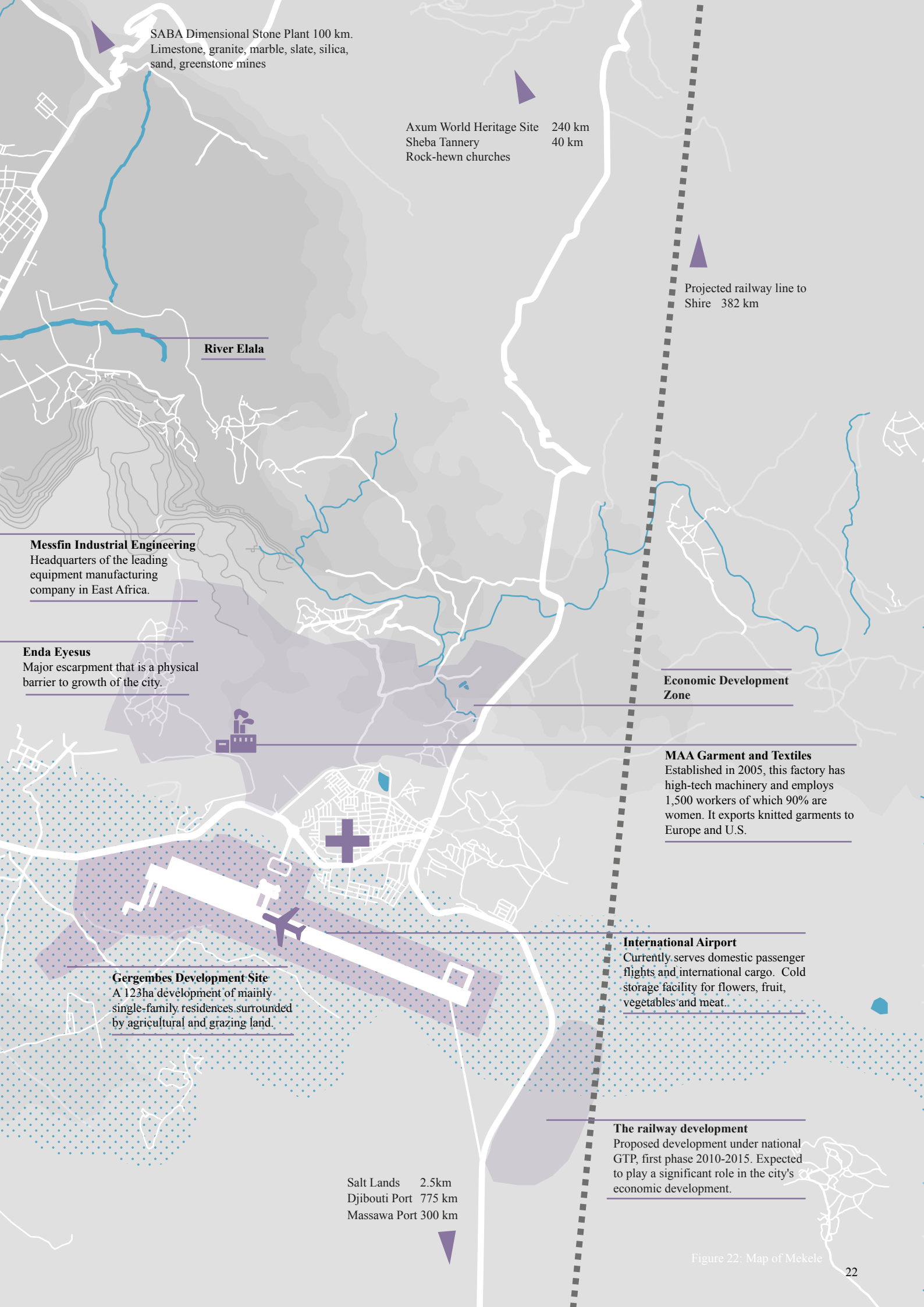


Figure 22: Map of Mekele

Summary of environmental risks

Mekele's main threat at present is to its water system. Other areas of concern are drought, flooding, water contamination and degrading air quality.

The key risk to Mekele is its water system, given the city's total dependence on underground sources and current lack of coverage. With the arrival of more heavy industry the potential risk to the water system and air quality, caused by fresh water contamination degradation of raw materials, will increase. These risks are exacerbated by industrial emissions and water contamination from effluents. In addition, environmental regulations are poorly enforced, enabling industries to extract some resources without paying for them.

Other threats may increase but are likely to be mitigated by the city. These include fuel scarcity (electricity provision) and disease risks (health improvements) in the city. These include seismic risk is an underlying threat and should not be overlooked. More attention needs to be given to appropriate building codes and enforcement of building regulations.

Three dimensions of environmental risk

Climatic risk

The impact of climatic events on urban populations, infrastructure and economies

Geophysical risk

The impact of geophysical events on urban populations, infrastructure and economies

Biological and natural resource risk

The impact of scarce or degraded natural resources on urban populations and economies

Types of threat or hazard, with current and estimated future risk rating

Extreme temperature

Mekele already has reasonably high temperatures, with a hot, arid or semi-arid steppe climate and an average annual temperature of 19.1°C. Future climate change projections for the city are yet to be located.

Storm

No evidence of current or future threat

Wildfire

No evidence of current or future threat

Drought

The country is currently facing a severe drought, and Mekele is already running dry of certain water sources. The city and area have had recurring drought every 2 to 3 years. Persistent drought has reduced groundwater levels, and climate change is expected to worsen droughts.

Flood

There is some seasonal flooding due to the lack of proper drainage network. Local environmental degradation including loss of riverside vegetation and low levels of unpaved areas in the city hamper flood protection.

Earthquake

Mekele is in one of the most seismically active zones in the country, with a 4.6 magnitude earthquake in 2013. Poor infrastructure maintenance and inadequate disaster response policy and building codes increase risk to life and property due to earthquakes.

Mass movement

Potential risk triggered by earthquake but not actualised yet.

Air quality degradation

As more industries are attracted to the city, existing air pollution concerns are expected to worsen. Natural factors such as the low tree coverage increase dust in the air. Minimal green space and smoke-generating fuels are other contributing factors.

Contamination or depletion of fresh water

67% of the city is covered by piped water connections, and the city rations water. Persistent drought has reduced groundwater levels which is expected to worsen water availability.

Crop disease, infestation or failure

No evidence of current or future threat

Disease or failure of livestock systems

No evidence of current or future threat

Fuel scarcity

Supply chain diversity has improved. The proportion of households using electricity increased from 5% to 40% between 2007 and 2011. However, a large majority of households still use wood and charcoal as primary energy sources.

Soil contamination and erosion

The city is in a hilly area, and soil erosion is already a concern. Poor waste water disposal practices and land management practices increase future risk for soil contamination and erosion.

Mineral depletion

Increased investment in limestone, marble, granite, and other deposits discovered near Mekele will increase pressure on mineral resources in the future.

Raw materials degradation or scarcity

Lax mining regulations and enforcement, particularly pertaining to cement factories in Mekele increase the risk of raw material scarcity in the future.

Loss of biodiversity

Deforestation and reduction of green space indicates loss of biodiversity. Poor environmental policy enforcement, inadequate planning controls, and poor ecosystem protection contribute to further loss of biodiversity.

Vector-borne disease

Communicable diseases, though largely preventable, caused by dense housing conditions and lack of vector control, are major health threats to the city.

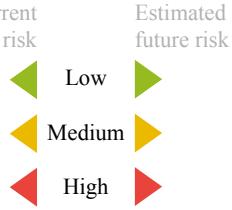
Water-borne disease

Poor sanitation systems, dense housing conditions and frequent seasonal flooding make Mekele highly prone to water-borne diseases.

Air-borne disease

Dense housing combined with poor health education and poverty increase the risk of air-borne diseases.

Legend



Future challenges

Industrial growth in Mekele is likely to increase environmental challenges for the fragile water system in Mekele and cause increased air pollution.

Industrial growth

With abundant mineral resources nearby, the city is likely to see growth in a number of extractive and agro-processing industries. In line with national ambitions, Mekele is already seeing substantial industrial activity: a cement, steel, garment and textile factories are being developed. The industrial manufacturing investment in Mekele is generating jobs, increasing economic output and improving livelihoods of people in Mekele. However the types of skills required cannot always be found locally. This means that the net impact on local unemployment may not be as great as projected.

The focus on industrial development is also increasing air and water pollution, which is an issue city stakeholders have highlighted as part of the Cities Alliance – Rapid City Resilience Assessment process carried out in 2016. Industrial emissions, mainly from the city's cement factory, are reducing air quality in the city. Combined with the impacts of deforestation that no longer protects the city from high winds, this is leading to respiratory and other health problems in the city. Air quality regulations are in place to help control these, but enforcement is a challenge (Cities Alliance, 2016a and Amdework pers. comm., 2016).

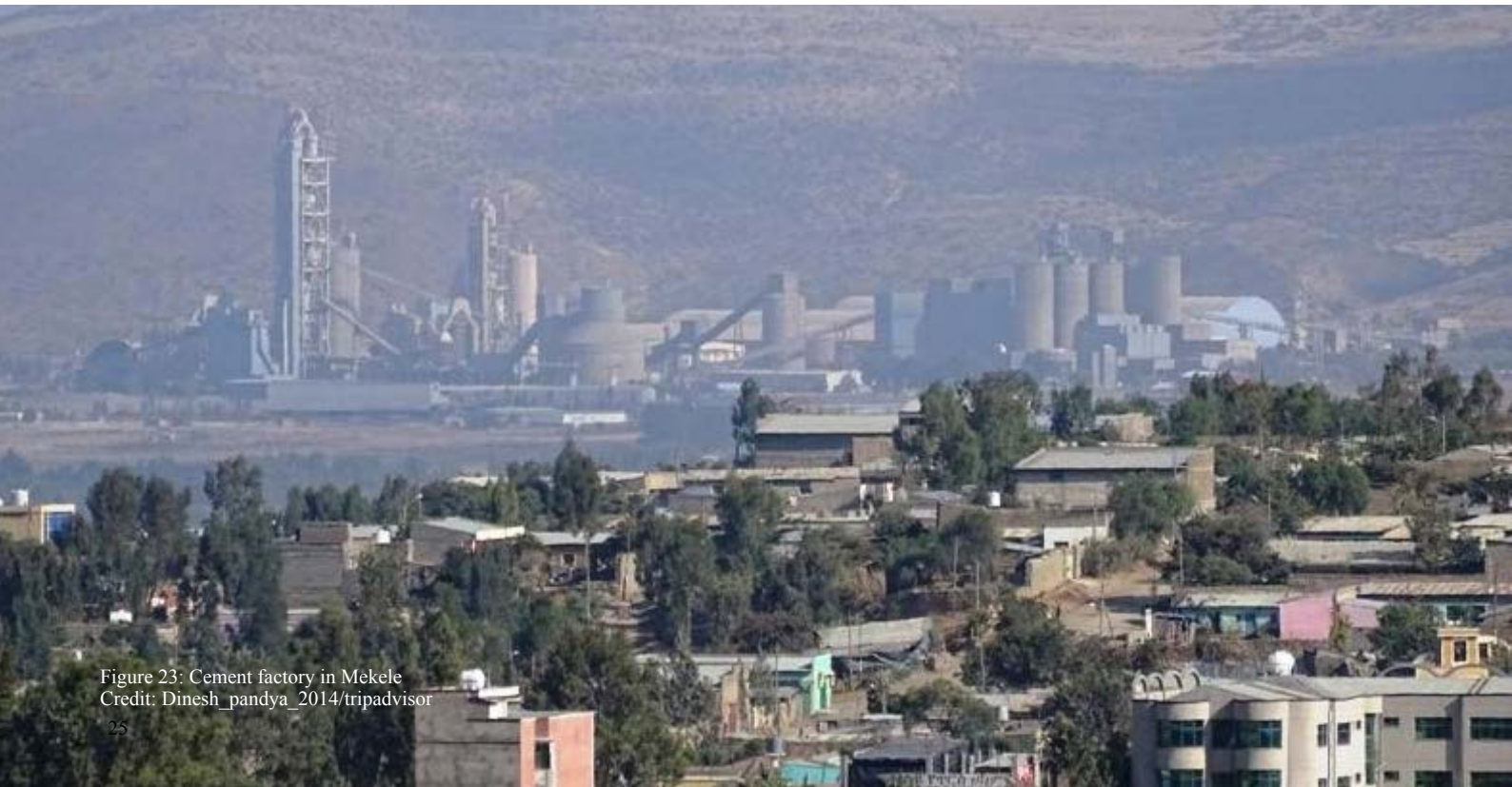


Figure 23: Cement factory in Mekele
Credit: Dinesh_pandya_2014/tripadvisor

A water system under threat

Mekele's only supply of potable (and non-potable) water comes from the Aynalem underground well-fields to the south of the city. Due to chronic drought, over extraction, and threat of contamination, this source of water is under serious threat. Water in Mekele is being contaminated from inadequate solid and liquid waste management and the absence of a proper sewerage system. The city is facing an increasingly severe water crisis, producing less than half the amount its residents consume each day (MCI, n.d.). With a projected significant increase in demand from new industry and population growth, the issue needs serious consideration to avoid continued over-extraction beyond the point of safe recovery. Climate change is likely to intensify the underlying threat to the water system caused by changes in rainfall patterns that influence groundwater recharge rates.

Geophysical risks

Mekele is in the Rift Valley, a prominent seismic zone that stretches through most of Eastern Africa. The United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA, 2007) indicates that the earthquake intensity in Mekele is likely to be "very strong" to "destructive" based on the Modified Mercalli Scale (MM), which describes the effects of an earthquake on the surface of the earth and integrates numerous parameters such as ground acceleration, duration of an earthquake, and subsoil effects. It also includes historical earthquake reports. Landslides are also a concern for Mekele, given its topography. These are even more likely to occur with widespread and on-going deforestation. The city needs to apply and enforce appropriate design codes.

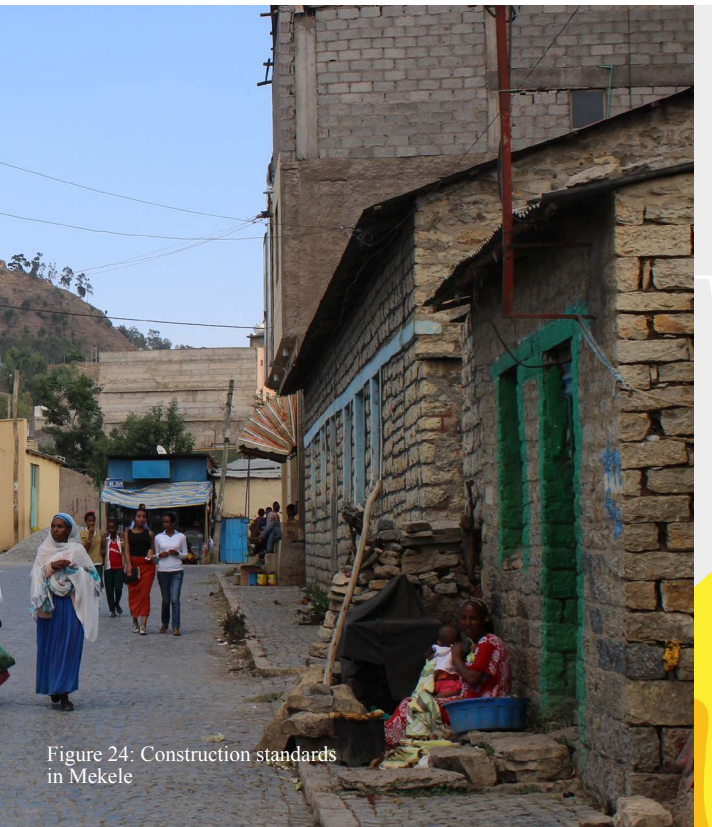


Figure 24: Construction standards in Mekele

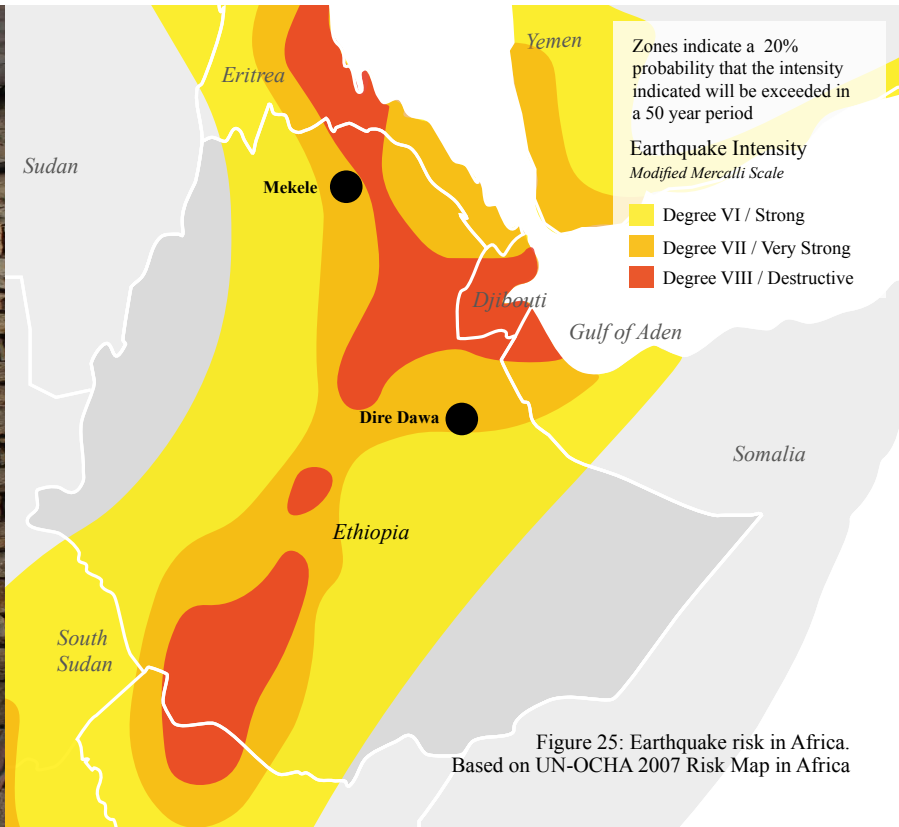


Figure 25: Earthquake risk in Africa. Based on UN-OCHA 2007 Risk Map in Africa

Dire Dawa

Dire Dawa is a relatively new city set among camel grazing plains, and is well connected nationally and internationally for exports. However it will need to overcome significant challenges arising from slum growth and poverty.

92%

of roads in Dire Dawa are paved

Known as the 'Queen of the Desert', Dire Dawa is a young urban centre by Ethiopian standards that grew around commercial export trade. Located at the foot of the Harrarghe Highlands (famous for the Harar coffee), nomadic Somali favoured the location for its excellent camel grazing lands. The extension of the railway from the coast of Djibouti brought about the establishment of the settlement in 1902. The city is home to significant historic sites, such as pre-historic cave paintings and a mix of Renaissance French architecture with Arabian and medieval Ethiopian influences too.

Today, Dire Dawa is one of the principal cities in Ethiopia, with an urban population of 285,000 in 2016 (CSA, 2013) although it is estimated to accommodate up to 395,000 people within the greater city boundaries (Cities Alliance, 2016b). The city is located in the east of the country along the Dechatu River. It covers an altitude from 950 to 1250m above sea level and has a warm and dry climate with relatively low precipitation. The city enjoys a unique status as the only 'chartered city' in the country outside of Addis Ababa, owing to persisting conflict between Somalia and Oromia Regions and the rich ethnic diversity of its inhabitants. As a chartered city Dire Dawa reports directly to the federal government and is able to set and collect land use fees, royalties for the use of forest resources in the city and levy taxes on incomes from agricultural activities in the city. The City is responsible for water and sewerage services, land development and management and sanitation. Ethnic groups in the area include the Oromo (45%), Somali (25%), Amhara (23%), Gurage (3%), and Harari (1%). It also has a number of Greek, Armenian, French and Arab inhabitants, a sign of its rich historic international trading roots and cultural diversity. The city's population is growing at an average rate relative to the rest of Ethiopia (around 3%).

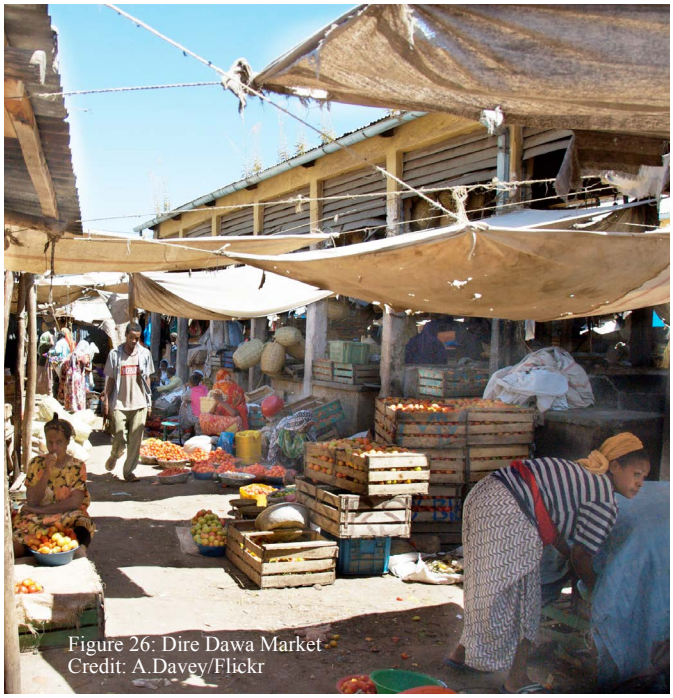


Figure 26: Dire Dawa Market
Credit: A.Davey/Flickr

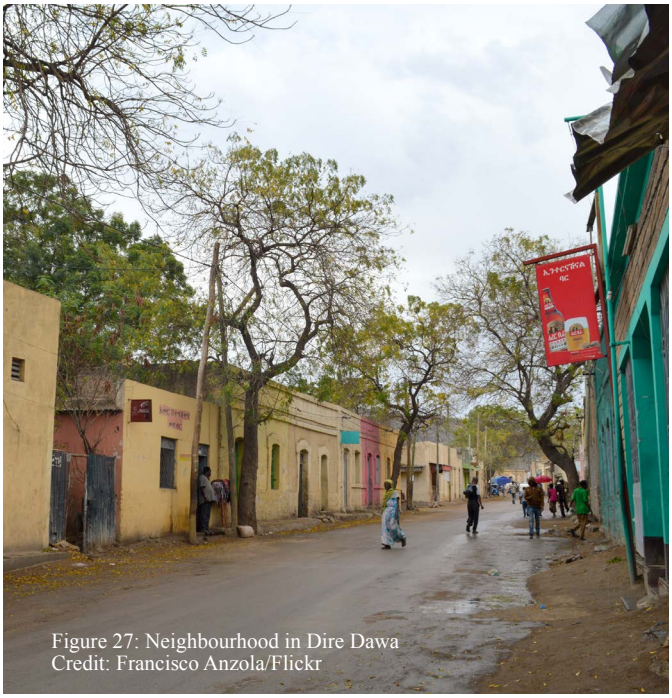


Figure 27: Neighbourhood in Dire Dawa
Credit: Francisco Anzola/Flickr

Dire Dawa in numbers

Citizenship

92%
Voters in 2005 election

27%
Net School enrolment rate age 4-6

2.3%
Population growth rate 1994-2007

Economy

2.7 SMEs
per 1000 people
2000 - 2006

33%
Youth unemployment rate

Governance

35.2
municipal employees/1000 residents

$530

Per capita expenditure in 2006

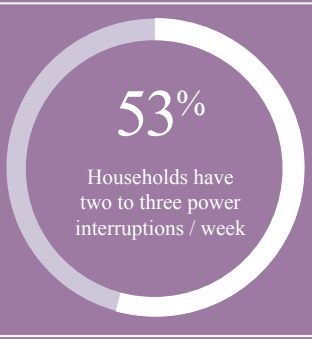
$661

Per capita revenue in 2006

Services

92%
Paved roads

5.5%
City area relative to informal settlements



Environment

48%
Households still using charcoal for cooking

Figure 28: Dire Dawa infographic

The city continues to play a significant role within Ethiopia thanks to its location along a principal export corridor that links the country to the rapidly expanding Djibouti Port. The city has an international airport and an inter-city bus service. The new Addis Ababa-Djibouti Railway started operating in October 2015, providing a revitalised link between Dire Dawa to Port Djibouti. The majority of roads in the city are paved (92%), although local road access outside the city is still poor. Basic services within the city are stretched and there is a critical shortage of housing and water supply. The city has a high rate of poverty – 35% compared to 14% in the Tigray regions – according to statistics from 2011.

Despite this, Dire Dawa has good economic growth prospects. The city has several market centres as well as cement, food, textile and steel manufacturing plants. Textile and cement industries in particular are expected to grow in the near future. The city has great growth potential, given its proximity to multiple ports in Djibouti, Somaliland and Somalia, and the productive Harrarghe Highlands. As well as being ripe for regional economic growth, Ethiopia's expanding international trade will mean the city is likely to become a trade hub for the entire country. The National Government has identified Dire Dawa as an industrial zone, which will likely attract further spin-off investment. Despite its promising economic future, recent events in Dire Dawa have proved that growth is not guaranteed. These include the reduction in contraband trade, privatisation of textile factories and the temporary closure of the major railway connection to Djibouti. But ensuring permanent and uninterrupted access to the port in Djibouti will secure a bright economic future for the city.

Dire Dawa is an important commercial and transportation hub with wide tree-lined streets and a modern urban plan. The city has attempted to deal with persistent challenges such as informal settlements, although these have continued to be a problem as discussed further below. It has a relatively high number of municipal employees per capita, although decentralisation has reduced its importance nationally. The city faces significant challenges with high levels of poverty, proportion of informal settlements and a huge backlog in housing, but it has the potential for increased economic growth that will bring the city additional revenue. Combined with economic growth, improvements in local land use management and local transport connections will help the city take advantage of these future opportunities.

Figure 29: Industry in Dire Dawa

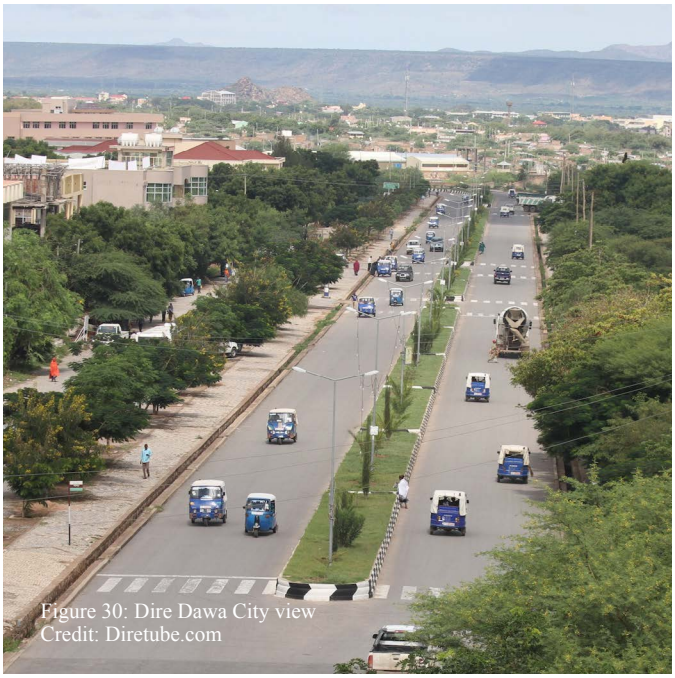


Figure 30: Dire Dawa City view
Credit: Diretube.com

What is shaping the city?

High levels of urban poverty

Dire Dawa has one of the highest poverty rates in the country, at 35% according to 2011 statistics, compared with only 14% in the Tigray region. The poverty rate has also increased 6% while it is declining in all other states. Dire Dawa's low performance is likely associated with a decline in both state (-34%) and municipal (-7%) revenues triggered through a reduction in contraband trade, the privatisation of the textile industry (and subsequent cuts to workers) and the temporary closure in the Ethiopia-Djibouti railway services. It is also suggested that regional decentralisation across the country has reduced the demand for public administrative services typically provided from Dire Dawa (World Bank & CA, 2015).

Poverty in informal settlements is a significant and consistent challenge for the city government. However, efforts have been made to legalise informal settlements and land management is highlighted as a government priority. Dire Dawa has a moderate population growth rate at present (3%) and unemployment is also moderate.

Advances in urban management

Dire Dawa is one of only two Ethiopian cities where the land area within the 'Urban Land Lease Holding System' – a system allowing the transaction of land use rights in a market-based economic system – is greater than the land area under a non-lease arrangement. The city was one of the first to implement the system. It is a major commercial and industrial centre where land for commercial and manufacturing purposes can only be obtained under the lease system. While having a lower budget than other regional capitals such as Mekele, Dire Dawa's revenue per capita is higher than the national average and has more municipal employees per capita than most Ethiopia cities.

Dire Dawa is also making strides toward regularising its informal settlements. Early attempts have been successful, however just five years after the regularisation the number of informal settlements had returned to previous levels (MUDHCo & ECSU, 2015), an indication that the land use management system needs improved mechanisms for dealing with the very high demand for land. The City also has to co-ordinate complex planning issues and implementing actions with two neighbouring Regions – Somalia and Oromia.

Figure 31: Street in Dire Dawa

Figure 32: Urban development in Dire Dawa

The need for housing

Despite the advances in land management there is room for improvement in housing, household electricity connections and environmental management. In 2008 the housing supply backlog was 24,000 units, with an annual demand growth of 2,900 units (UN-HABITAT, 2008). Several factors are also contributing to the growing backlog, including high construction costs (nationally) and an inability to recoup these costs with rental income.

Figure 33: Informal development in Dire Dawa

Key Themes

Citizenship

High poverty
The city has one of the highest proportions of land area for informal settlements, as well as a very high poverty index that is increasing (2011 figures).

Lack of consultation in planning
Planning participation is low over two years only two public meetings were held on the prioritization of capital projects and the Capital Investment Plan (CIP).

High ethnic diversity
Dire Dawa has great ethnic diversity with 45% Oromo, 25% Somali, 23% Amhara and 3% Gurage peoples. Historical tension between ethnic groups has existed in the past.

Economy

Challenges to local economy
Dire Dawa has recently faced challenging economic events: exchange rate and tax-related reforms leading to a reduction in contraband trade -with major effects on employment-, privatisation of a large textile factor leading to worker retrenchments, and temporary closure of the Ethio-Djibouti Railway Transport Service.

Good economic growth prospects
There are many private cement, food, textile, and steel manufacturing plants in the city and the textile and cement industries are expected to grow. Proximity to ports in Djibouti, Somaliland and Somalia, and the fertile Harrarghe Highlands make it well positioned for regional economic growth.

High informality in economy
Informality is raised as a key challenge by stakeholders – there are still a large number of informal settlements, as well as unemployment levels.

Governance

Land use planning
Land management is highlighted as a key priority for stakeholders – for example there are incompatible land use developments such as allocation of prime land along the major arterial roads to inappropriate functions, or riverside zones being developed.

Implementation of land use plans
Attempts to regularise informal settlements by government were temporarily successful. The land use management systems lack fundamental changes due to inefficiencies in dealing with land demand, limited co-ordination and lack of action due to the city's location between two regional states.

Status as chartered city
Dire Dawa enjoys the status of a "chartered city" , which means that, like Addis it is under Federal legislation. It therefore has full autonomy over urban land tariff regulations.

Services

Poor water supply
Water provision to households is still limited. Most only receive water once a day. There is an absence of domestic waste treatment. The city is also under stress in terms of public health provision.

Lack of housing
There is a significant lack of housing. As well as meeting this challenge, land management practices will likely need radical reform in order to avoid growing informal settlements and urban sprawl.

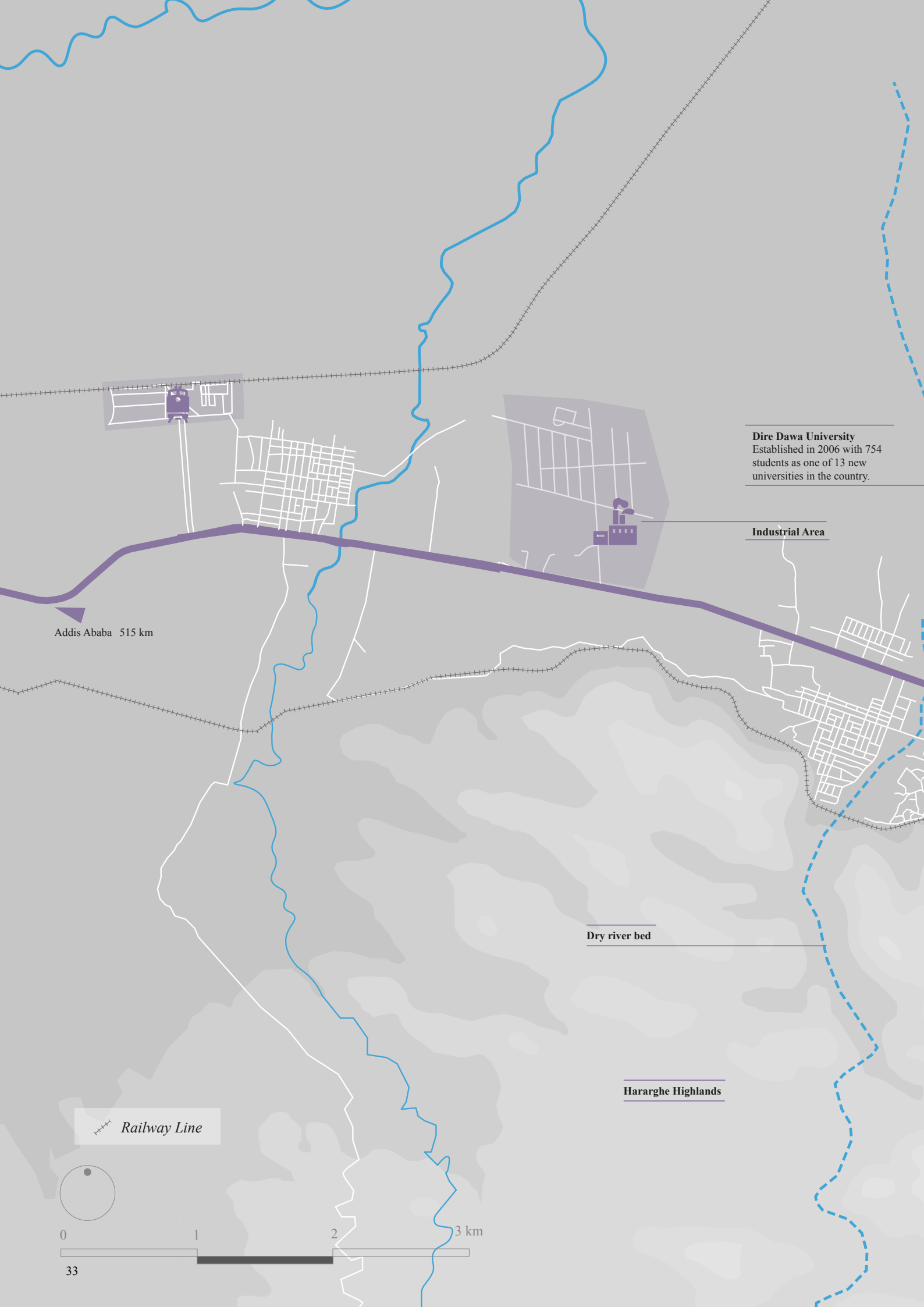
Poor road linkages
Despite good regional connections, local road access and links to different parts of the city are poor. Social services in the city are also scarce.

Environment

Flooding
Flooding is a key threat for Dire Dawa, with riversides still vulnerable. Flooding is driven by a decrease in upland forest cover and unplanned expansion into urbanised areas.

Alternate energy sources
Deforestation is a key issue for Dire Dawa, with charcoal use still high. Alternative energy sources are required.

Abundant water sources
Unlike Mekele, the groundwater supply is abundant, although rainfall has been unpredictable recently. This is linked to climate change.


Dire Dawa University
Established in 2006 with 754 students as one of 13 new universities in the country.
Industrial Area
Addis Ababa 515 km
Dry river bed
Hararghe Highlands
Railway Line
0
1
2
3 km

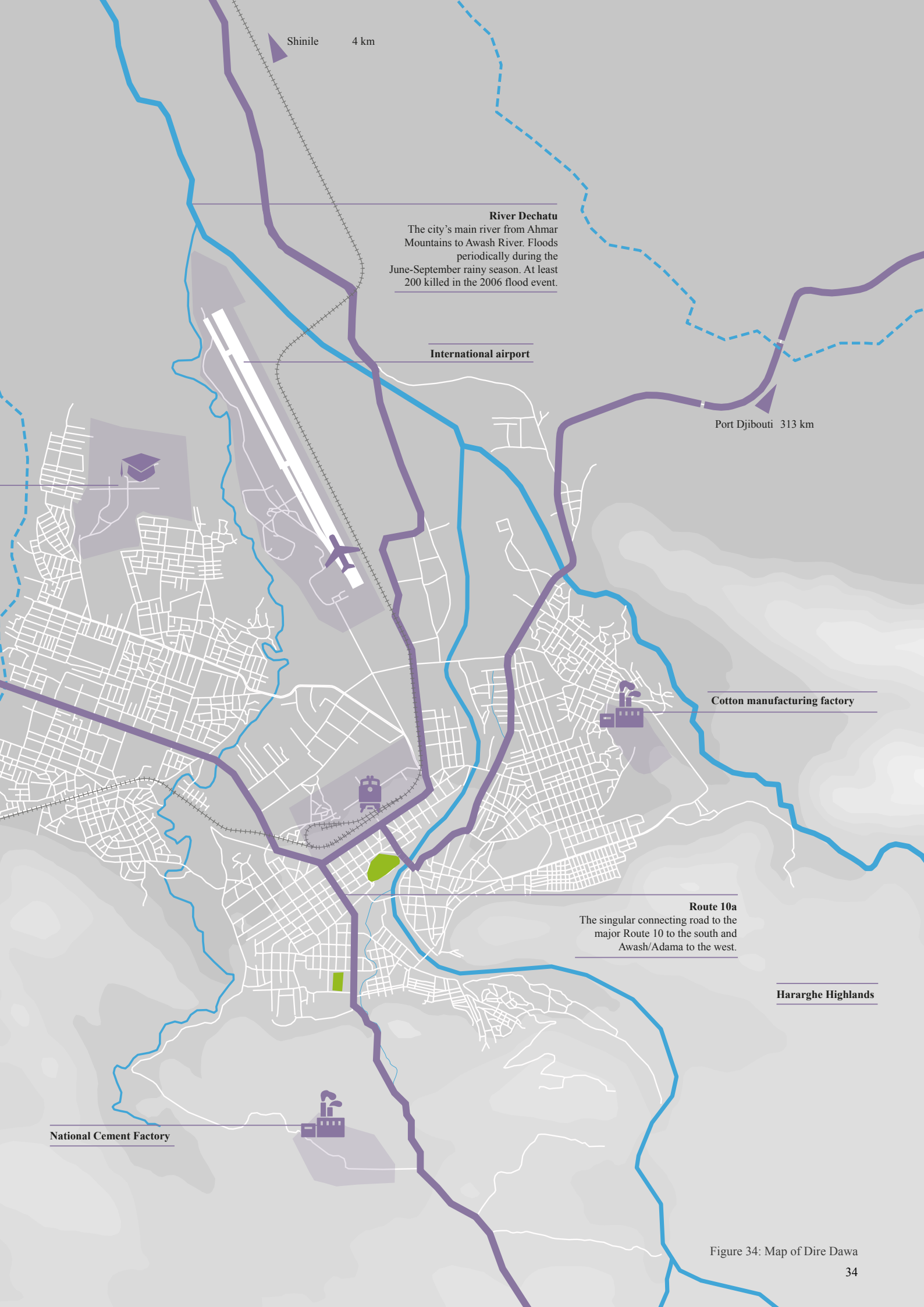


Figure 34: Map of Dire Dawa

Summary of environmental risks

The main threats for Dire Dawa at present are extreme temperature, drought and water contamination.

Dire Dawa is located very close to a seismic fault line in a semi-arid area of the country where there is little rainfall. The region is currently experiencing a drought. With future climate change anticipated, and driven by the depletion of ground water resources, these risks will increase. Poor design and construction in the city will continue to contribute to the lack of water retention, unless better drainage management is implemented.

As Dire Dawa could potentially grow its mineral industries, the depletion of raw materials and minerals may become a risk.

Three dimensions of environmental risk

Climatic risk

The impact of climatic events on urban populations, infrastructure and economies

Geophysical risk

The impact of geophysical events on urban populations, infrastructure and economies

Biological and natural resource risk

The impact of scarce or degraded natural resources on urban populations and economies

Types of threat or hazard, with current and estimated future risk rating

Extreme temperature

Dire Dawa has a hot and dry climate with an average temperature of 24.6°C. Climate change models predict a 3C increase in average annual temperature by 2090. Poor housing conditions and lack of green space exacerbate the effect of high temperatures.

Storm

No evidence of current or future threat

Wildfire

No evidence of current or future threat

Drought

Drought is a common problem in Dire Dawa. The frequency is expected to increase due to the impact of climate change. Groundwater levels have been depleted in the area around the city due to natural causes and improper planning and construction practices.

Flood

Rivers near the city flood seasonally, and the impact of flooding is heightened due to the proximity of settlements near rivers, removal of protective vegetation from river banks, and construction in lowlands. In the last few years, the city has made efforts towards flood resilience.

Earthquake

While the city has not experienced any recent earthquakes, it is in a medium-risk seismic zone and located near a major fault line. Poor quality infrastructure and poor disaster response policy may cause increased damage to life and property in case of an earthquake.

Mass movement

No evidence of current or future threat

Air quality degradation

Air quality is cited as one of the city's main environmental challenges. In spite of mitigation measures, industrial pollution is degrading air quality. The lack of green space and use of smoke-generating energy sources in households worsens air quality.

Contamination or depletion of fresh water

The inadequacy of water sources is compounded by ground water contamination caused by the lack of effective wastewater disposal and treatment systems.

Crop disease, infestation or failure

No evidence of current or future threat

Disease or failure of livestock systems

No evidence of current or future threat

Fuel scarcity

Approximately 80% of households use charcoal and wood for cooking. In the absence of alternative fuels, the use of charcoal and wood is expected to lead to deforestation.

Soil contamination and erosion

Dire Dawa is in a region with sandy soil that is already prone to erosion. Overgrazing, deforestation, and poor land management policies increase the risk of soil contamination and erosion.

Mineral depletion

Mineral deposits have been discovered around Dire Dawa, and the area is considered attractive for investment in mining.

Raw materials degradation or scarcity

While extraction of mineral deposits near Dire Dire does not occur on a large scale, increased investment in mining may lead to raw material scarcity if not managed properly

Loss of biodiversity

Reduction of green space and deforestation suggests a loss of biodiversity. Deforestation is expected to increase with population growth, worsening the loss of biodiversity.

Vector-borne disease

Dire Dawa is in a malaria-prone region, and epidemic-like conditions have broken out during floods. While poor housing conditions and poor vector control increase risk, action taken by health personnel has considerably improved the situation.

Water-borne disease

Dense housing conditions with poor access to sanitation combined with frequent flooding increase the risk of water-borne diseases.

Air-borne disease

Dense housing conditions combined with poor health infrastructure increases the risks of epidemics due to air-borne diseases.

Legend

Current risk / Estimated future risk

- Low
- Medium
- High

Future challenges

In addition to environmental risks, continued improvement to land management systems are required to deal with a rapidly growing population.

Informal settlements and land management

Informal settlements have become a key concern in Dire Dawa due to the scarcity of housing in planned areas. This is resulting in land being occupied and developed informally in marginal areas, such as in flood plains. In 2006, a flood claimed the lives of over two hundred people in the city. In response the city has focused efforts on improving the quality of housing through legalising land rights and in carrying out regular disaster risk reduction activities. In the same year the city made a significant effort to legalise housing in informal settlements, issuing 13,000 new title deeds. A few years later illegal houses continued to emerge, demonstrating the demand for housing is not being addressed within the present land management system. This persistence of poor housing conditions in unplanned areas is increasing the city's environmental risk to a number of threats or hazards such as: extreme temperatures; water, air, and vector-borne diseases; and natural hazards such as flooding and earthquakes). Huge efforts have been made to address the issue of informal settlements. Dealing with these risks will require further investment, but the pressure is unlikely to be released until the issues of housing and informality have been solved. Land management and housing systems need improved service delivery models to cope with the large demand.

Ethnic diversity

Dire Dawa has great ethnic diversity with 45% Oromo, 25% Somali, 23% Amhara and 3% Gurage people. While this diversity is a significant advantage there has been an historical tension between ethnic groups in Dire Dawa in the past.

Figure 35: Informal housing in Dire Dawa

Earthquakes

Dire Dawa is located very near to a major fault line in the Rift Valley. The science indicates that there is a clear risk of earthquakes and landslides in Dire Dawa. The city needs to develop and/or apply appropriate design codes and ensure that these are enforced. The city needs to work with communities to ensure informal settlements are also building safely and are aware of the risks.

Water security

Despite the apparent availability of ground water, Dire Dawa has almost half the annual rainfall of Addis Ababa – 590mm compared with 1200mm. The city has a high water table and sandy soil. The combination of these two factors mean that in Dire Dawa water infiltrates into the ground very quickly and is very vulnerable to pollution. With widespread informal settlements and an absence of domestic waste treatment and sanitation systems, water contamination should be a serious concern for Dire Dawa. In addition, current urban expansion is occurring toward sources of ground water for the city which may impact the overall capacity for groundwater recharge in the city. Finally, ageing and inadequate water infrastructure is leading to pipeline blockages and bursts caused by encrustation.

Figure 36: Water vendors in Mekele

Final Thoughts

Drivers of city growth are likely to be regional connectivity and reliable energy. Challenges of land management, local connectivity, informal housing, and environmental protection will need to be overcome to achieve balanced development.

Location and role of the city

Cities in Ethiopia have historically developed based on favourable geographic position, easy access to natural resources, and ease of movement (e.g. along a river) – all of which relate to location. Ethiopia has decided to adopt a national planning approach that promotes regional cities. Two key defining features of regional cities in Ethiopia are: location and connection to a hinterland. Administratively, this planning approach enables cities such as Mekele to act as a regional capital within a wider state. Dire Dawa has unique status as it does not administer a wider region and reports directly to the federal government. Its administrative function has been determined through politics as it lies strategically between the states of Somali and Oromia. This nuance has led to governance complexities in tackling cross-boundaries issues including illegal land transactions and environmental management.

Planners should be clear on what role the city is playing within the wider national urban system. Having this clear vision can allow limited resources to be used effectively at both the federal and city level. For Dire Dawa this means understanding its role within the economic corridor between Addis Ababa and Djibouti and building on its strengths as a charter city with strong strategic location, good urban management, diverse population, and human resource. Because of these unique features both Mekele and Dire Dawa will continue to thrive as a result of their strategic locations.

Figure 37: Mekele commercial street
Credit: Raul Soler / Flickr

Investing in growth

Both Mekele and Dire Dawa struggle with youth unemployment which is a national challenge. To capitalised on the demographic dividend, cities should develop targeted and city-specific economic development plans that consider key growth sectors and development needs and that are aligned with labour strategies. Training programmes and systems should be developed in collaboration with educational institutions to meet the anticipated skills demand, at the right time.

Continued investment is needed in physical infrastructure. Investment in transport corridors will connect Mekele to other important cities and ports, increasing its ability to trade primary goods and carry out manufacturing. Cities and the federal government also need to invest in improving the regional (hinterland) infrastructure, such as transport networks (e.g. road and rail) to reduce transport times and costs to other locations in the Tigray region, and to enable dispersed business growth. In Dire Dawa, implementing cadastral mapping and increasing the planning capacity could have the most significant impact on a range of issues the city is facing.

Figure 38: Dire Dawa Street Market
Credit: A.Davey/Flickr

Planning for economic growth

Ethiopian regional cities can successfully lead inclusive economic growth through planning. The federal government has made progress in delivering land for economic development in accessible and well-connected locations. To manage this process the government has improved land management systems and taken steps toward devolved governance through the 'Urban Land Lease Holding System' which facilitates access to land for the private sector. Some challenges remain in implementing the system, such as a lack of legal frameworks, baseline information (such as cadastral mapping, base maps and deed titles), physical tools (computers and software) and skilled human resource (MUDHCo & ECSU, 2015). Improvements in these areas will enhance the city's ability to collect much needed land-based revenues, and also facilitate co-ordination of infrastructure provision. Space within the cities needs to be allocated to accommodate future growth in infrastructure, housing, and areas for economic development.

Equal focus needs to be given to locating future growth areas in areas with adequate natural resources and management systems in place to sustain them. Locations should be selected based on evidence of environmental risk to minimise the impact on sensitive assets such as the water table. Evidence suggests that recent development has negatively impacted on the liveability of the city. This needs to be considered so that economic growth does not threaten the city's identity and overall competitiveness.

Mekele and Dire Dawa need to invest in environmental management to safeguard vital resources and secure the long term future of both cities. Finally, both cities need to involve their citizens in the planning process to build collaboration and ownership over plans.

Figure 39: Street market in Mekele
Credit: Indrik Myneur / Flickr

Supply of basic infrastructure services

The supply of basic services in Mekele and Dire Dawa needs to improve, particularly in critical areas of water supply, housing, electricity provision, waste management and sewerage.

Access to clean safe water is a basic human need. For both Mekele and Dire Dawa balancing the water demand for domestic, commercial and industrial use needs to be addressed urgently. Mekele's groundwater resource is at risk. Increased water demands from current population and industrial growth will limit growth and investment in the region. Linked to water supply is the quality of water. In both Mekele and Dire Dawa inadequate waste management and the lack of sewerage is the greatest environmental and health hazard. The situation is a direct health hazard and the potential for water and soil contamination further spreads the health risks and damage natural resources.

A key driver of the local housing deficit in both Mekele and Dire Dawa is the lack of affordable housing stock that has resulted in widespread informal settlements, as discussed previously. Current building regulations promote modern construction technologies such as the use of hollow concrete blocks, which are largely imported and expensive. Traditional technologies, including the use of bamboo, are discouraged. In seismic areas, building codes are a key factor of resilience, but this must be balanced with the ability to build and repair using proposed technologies, along with affordability. The regulations may need to be reviewed from this perspective to ensure that the codes are appropriately adapted to the risks.

Ethiopia is blessed with ample renewable energy sources such as hydropower, which it is diligently investing in. Cities are nevertheless plagued by transmission issues resulting in extremely poor reliability. This affects businesses directly, as well as having an indirect effect on the provision of services such as water supply. Reliable and affordable electricity for residences will also improve general urban health and the environment. The main source of energy for households is predominantly still wood fuel and charcoal, although electricity is increasingly being used.

Figure 40: Neighbourhood road, Dire Dawa

Low carbon development

Ethiopia has seen rapid economic growth in recent years with growth rates over 10%. Growth has been driven by sectors such as light industry and trade, with rapid urbanisation and recent development of industrial zones. The country is still relatively un-urbanised and set to continue rapid economic growth. The recent Growth and Transformation Plan II shifts focus to heavy industries to accompany light manufacturing, for which the aim is to become the largest manufacturer in Africa. These processes have the potential to significantly contribute to carbon emissions, whilst at the same time offer opportunities for low-carbon development.

An Overseas Development Institute (ODI) study analysed economic and environmental factors in sub-Saharan Africa, and identified twenty long-term cross-sector initiatives that can promote low-carbon development in sub-Saharan African countries (Hogarth et al, 2015). Some of these initiatives have higher applicability to Ethiopia, as indicated in Figure 41. A full list of these initiatives are included in Appendix A.

In regional cities and urban areas generally, formalising the charcoal industry and promoting efficient cooking stoves will be important as currently charcoal use is high in households, leading to both indoor air pollution and deforestation. Generating on-grid electricity from renewable power, developing higher density multi-use urban plans and mass transportation systems are all interventions that the country has already made progress in or are not rated most relevant at this time but given their significant low-carbon development contributions, remain key opportunities.

For Ethiopian regional cities the most significant interventions will revolve around heavy industries, the extractive industry and the booming construction industry. Given the likely future growth of mining and its high energy use, using energy efficient processes and renewable energy sources will be key for low-carbon growth. With the fastest growing construction industry in the region, incentivising low-carbon materials and methods will also be a big win, as will energy efficient processes and technologies in heavy manufacturing, another energy-intensive and growing sector. Targeting these interventions, Ethiopia has strong prospects for low-carbon development.

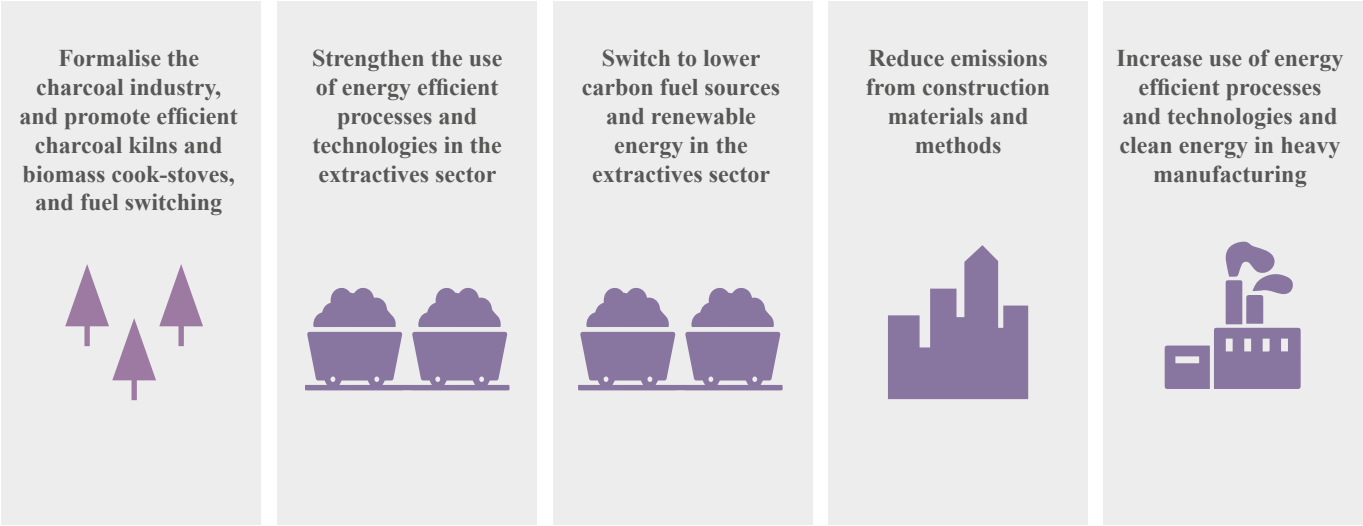


Figure 41: Key initiatives for low-carbon development along regional cities in Ethiopia

Appendix

A. Low-carbon development initiatives mapping

Building on the in-depth sector analysis, ODI identified 20 long-term cross-sector transitions (or initiatives) that can be undertaken to promote low-carbon development in Sub-Saharan Africa (SSA). To rank and score these initiatives, they developed a preliminary methodology using a set of four criteria: (1) the level of GHG emissions that they could avoid; (2) the risk of lock-in that they could avert; (3) their contribution to increased productivity; and (4) their contribution to poverty reduction. These initiatives were scored as having high, medium or low potential in promoting low-carbon development. Based on research carried out for this report we have provided a qualitative comparative score based on country specific knowledge.

Legend
Potential for supporting low-carbon economic development

- High
- Medium
- Low

Cross-sector transitions / initiatives	SSA	Ethp.	Why is it relevant in Ethiopia?	What is the opportunity in Ethiopia?
Agriculture				
Reduce demand for agricultural land by intensifying production and reducing post-harvest waste			85% of Ethiopia's population is employed in agriculture, but this primarily occurs in rural areas. However regional cities source their food supply from surrounding hinterlands and therefore influence and are influenced by these processes. Urban sprawl is putting pressure on the ecosystems in these hinterlands, and so there can be a tension between urban development and agriculture. For example surrounding the Gergembes development site in Mekelle is agricultural land.	Ethiopia currently suffers post-harvest losses in agriculture of 30-50% so there is room for improvement in this area. Furthermore, the country aims to enhance its economy partly through increased productivity in agriculture (see the Growth and Transformation Plan II). This is likely to stimulate demand for training, for example in the Agricultural College in Mekelle. While these opportunities are predominantly rural in nature, intensifying agricultural production elsewhere will alleviate the tension with agriculture on urban peripheries, and allow densification of urban and peri-urban areas with benefits of economic efficiency
Reduce emissions from livestock			Livestock husbandry is low in Ethiopia's cities but an increasing demand for meat consumption from urban residents with growing incomes will have a direct effect on livestock emissions.	Increasing meat demand in cities is likely to increase with economic development, creating a need to consider livestock emissions. The Government of Ethiopia's Climate-Resilient and Green Economy Strategy aims to increase poultry's share of national meat consumption from 15% to 30% by 2030. These are relevant opportunities, but primarily rural in nature.
Diffuse climate-smart agriculture practices			While the majority of agriculture occurs in rural areas, regional cities especially source their food supply from surrounding hinterlands, and some urban agriculture occurs within the city. This includes vegetable producers in Addis Ababa who have been farming using traditional methods for three decades and other underestimated urban food production that has a role in food security.	Urban agriculture has been recognised in the Addis Ababa master plan, and the government has established the Department of Urban Agriculture at both city and sub-city levels. While climate-smart interventions will mostly be applicable to large-scale agriculture, some benefits will come from climate-smart urban agriculture. These will likely be around food security and improving livelihoods (see Ashebir et al.) as opposed to a significant impact on carbon emissions given the traditional farming methods currently being practiced in these contexts.
Forestry				
Integrate rural land-use planning			Not applicable to secondary cities.	N/A
Capture the value of forests' ecosystems services			There is significant deforestation in Ethiopia, and reported in both regional cities studied. Key factors for deforestation include shifting agriculture, livestock production and fuel in drier areas. While predominantly a rural issue, forest ecosystem services are of importance to cities for example upland forests protecting Dire Dawa from flooding.	Currently there is little valuation of forest ecosystem services in and around urban areas in Ethiopia. This intervention will be of great benefit nationally but less so specifically to regional cities.

Energy				
Formalise the charcoal industry, and promote efficient charcoal kilns and biomass cook-stoves, and fuel switching			Charcoal use was reported to still be high in both cities. 80% of households in Dire Dawa used charcoal or wood fuel for cooking for example.	Switching to more efficient and reliable sources of energy will reduce environmental damage, especially deforestation in urban surrounding areas.
Generate on-grid electricity from renewable sources and prevent lock-in of coal power			Cities in Ethiopia are challenged by transmission issues with electricity resulting in poor reliability. This affects businesses as well as the provision of basic services such as water.	Unreliable energy threatens economic growth in Ethiopia, while reliable and affordable electricity for residences in Ethiopian cities will improve general urban health and the environment. Ethiopia has great potential for renewable energy including hydropower, wind, solar and geothermal. It aims to generate an additional GW over the next decade through geothermal alone, and solar plants for over 100MW are being constructed. There are national strategies to formalise and manage biomass industries. In May 2015 Ethiopia opened its third wind farm which is the largest in Sub-Saharan Africa at 153MW capacity. With energy demands continuing to increase, there is a continued opportunity for investment in renewables - rated 'medium' as much investment is already occurring.
Promote electricity access from off-grid and mini-grid systems in rural areas			Very important for rural development, but not applicable to secondary cities.	N/A
Transport				
Remove fossil fuel subsidies for consumption			As part of the Friends of Fossil Fuel Subsidy Reform, Ethiopia is committed to phasing out "inefficient fossil fuel subsidies that encourage wasteful consumption". The government has also introduced ethanol blending in October 2008 and increased to 10% in 2011. While it is hard to find exact figures, it appears subsidies for consumption have been removed.	Ethiopia has already made progress in removing fossil fuel subsidies. Since the recent subsidy reform, Ethiopia has seen a decline in kerosene and an increase in the use of electricity and biofuels. There is therefore not as big an opportunity remaining in this country.
Shift to a low-carbon automobile fleet and fuels			Ethiopia has a very low car ownership rate, at only 3 vehicles per 1000 people in 2007. However due a large influx of cars into the country (thousands per year according to estimates) Addis Ababa is already experiencing serious congestion. Between 2011 and 2014 private car ownership has gone up 50% from under 100,000 to around 150,000 in the capital.	While important, the opportunity is limited given the very low car ownership in Ethiopia and the fuel initiatives already implemented: Ethiopia's National Biofuels Policy for example promotes ethanol biofuels for blending with gasoline for transportation.
Implement higher density multi-use urban plans			Both cities studied have a high proportion of people living in informal settlements, with a demand for housing that challenges land management systems. Due to shortage of housing in the formal sector, land is being used in vulnerable marginal areas for example that are susceptibel to flooding. However regional cities are set to continue to grow with high urbanisation rates across the country.	While Dire Dawa has implemented land use management systems, both cities struggle with land demand and urban sprawl. Effective urban planning will help maximise provision of basic services, revenue collection and implement low-carbon transport designs.
Promote mass transportation systems			Urbanisation and population growth is occurring rapidly, and national plans to attract investment to cities include finalising ongoing transportation development.	Addis Ababa has set a precedent in Africa with the first light rail network launching in September 2015 and a Bus Rapid Transit (BRT) to come into operation in three years' time, which will also be a first for East Africa. This is important as 60% of the population still walk to their destination. Promoting similar mass transport options will be a key opportunity for low-carbon development in other rapidly developing cities, contributing towards economic development in an equitable way - rated 'medium' as mass transportation already being implemented in Addis Ababa and a future opportunity for regional cities as they grow.

Extractives				
Strengthen the use of energy efficient processes and technologies in the extractives sector			Mining is a significant industry in Ethiopia and the country still has a wealth of unexploited minerals suggesting future growth in this sector. Currently mining only comprises 1% of GDP with gold, gemstones and industrial minerals most important, but mining for gold and potash amongst others is a key development sector for the country. Cement industries exist in both cities studied, and Dire Dawa is an attractive investment area given mineral deposits found there. "	Given the high energy use in mining activities, these measures will have significant contribution to carbon emissions.
Switch to lower carbon fuel sources and renewable energy in the extractives sector			Mining is a significant industry in Ethiopia and the country still has a wealth of unexploited minerals suggesting future growth in this sector. Currently mining only comprises 1% of GDP with gold, gemstones and industrial minerals most important, but mining for gold and potash amongst others is a key development sector for the country. Cement industries exist in both cities studied, and Dire Dawa is an attractive investment area given mineral deposits found there.	Given the high energy use in mining activities, these measures will have significant contribution to carbon emissions. There is great potential for renewable energy sources in Ethiopia some of which are already being harnessed including solar, wind and geothermal.
Remove and avoid subsidies for fossil fuel production			Ethiopia had a relatively high level of subsidies for fossil fuels in 2013, but since 2011 they have been under reform and no longer has subsidies. The country is part of the 'Friends of Fossil Fuel Subsidy Reform' that includes Costa Rica, Denmark, Finland and New Zealand.	Given the reform that has already occurred to Ethiopia's fuel prices, there is less of an opportunity here.
Construction				
Reduce emissions from construction materials and methods			Ethiopia's construction sector is set to grow at over 10% in the next ten years, outgrowing other countries in the region. The construction industry is driving current investment in cities such as Mekele. Major construction investments include wind and hydropower projects, housing and railways.	Current building regulations promote modern construction technologies such as the use of hollow concrete blocks, which are largely imported and expensive. However there is therefore an opportunity to ensure the construction materials and methods are low-carbon too. Given the rapid growth of this sector including some very large individual projects, this is a key low-carbon growth opportunity. Evidence suggests that considering embodied carbon in the construction process would greatly add to sustainable construction.
Reduce emissions from buildings operations			With rapidly increasing incomes across Ethiopia, energy consumption in buildings is projected to grow.	National level criteria on low-emission operations that guide local building codes could be implemented.
Manufacturing				
Increase use of energy efficient processes and technologies and clean energy in heavy manufacturing			Ethiopia has targeted industrial zones as part of its long-term national growth strategy, and heavy industries are given special attention in the latest Growth and Transformation Plan II (GTP II). The sector is growing, for example with a number of cement industries in Mekele.	Heavy manufacturing is driven by a few multinational organisations for industries such as iron or steel production, and special incentives are given for the industrial parks. Given the policy focus on this sector and its likely future growth, along with impact of implementing energy efficient processes amongst a relatlively small number of actors, this is a key low-carbon opportunity.
Drive growth in light manufacturing			Light manufacturing has been key for Ethiopia in recent years, featuring in the GTP I. Key industries have included food, beverage, leather, wool and textiles. While adding heavy industries to its growth plan, the country aims to be the light manufacturing leader in Africa by 2025.	While there is a shift in focus towards heavy industry in GTP II, light industries are still a priority for the economy and expected to continue to grow - therefore are an area of opportunity for low-carbon development - 'medium' rating as light manufacturing is already strong.
Develop low-carbon products			Ethiopia is rapidly industrialising including in regional cities such as Mekele and Dire Dawa.	There appears little directive towards low-carbon products at present, but given that industrialisation is in its infancy in the country, there is an opportunity to direct production towards low-carbon products.

B. Information mapping

We followed a subjective process to assess the information that was immediately available for each city. Information was supplied by Cities Alliance and Future Cities Africa teams. Arup carried out a global information scan to identify whether any gaps could be readily filled with open-source information. We applied a rating to this information according to quality and availability of data or information on each sub-dimension within the revised normative framework.

For Ethiopia overall, information on citizenship, the economy and governance was moderately available although there was a lack of information in specific areas such as representation and accountability in local governance, social capital of citizens and the local enabling environment for effective local governance and economic progress. More broadly, information with respect to both city and environmental services was generally lacking in both Mekelle and Dire Dawa.

	Mekele	Dire Dawa	**Overall**
Citizenship			
Participation	Moderate	Moderate	Moderate
Social capital	Low	Low	Low
Community awareness and preparedness	Low	Moderate	Moderate
Civil rights and justice	Moderate	Moderate	Moderate
Economy			
Human capital	Moderate	Moderate	Moderate
Institutional environment	Low	Low	Low
External macro environment	High	High	High
Industry	High	High	High
Outputs	Moderate	Moderate	Moderate
Governance			
Enabling environment	Low	Low	Low
Municipal finance	High	High	High
Representation and accountability	No data	No data	No data
Municipal capacity	Low	Low	Low
Risk management	Low	Moderate	Moderate
Planning	Moderate	Moderate	Moderate
Services			
Social services	Low	Moderate	Low
Basic services	Moderate	Moderate	Moderate
Economic services	Low	Low	Low
Emergency services	Low	Low	Low
Environment			
Protective ecosystem services	Moderate	Moderate	Moderate
Regulating ecosystem services	Low	Low	Low
Natural resources	Moderate	Low	Low
Cultural ecosystem services	Low	Low	Low

Legend

High	A substantial amount of information that is sufficiently detailed enough to use in further analysis work
Moderate	An average amount of information of adequate detail. Information may require interpretation for further analysis work. Additional research is suggested.
Low	A limited amount of information, or information of low quality or partially available information. More research is recommended.
No data	No data was initially supplied by Cities Alliance or Future Cities Africa team. A reasonable amount of time was spent looking for additional open-source information and none was readily available for the city.

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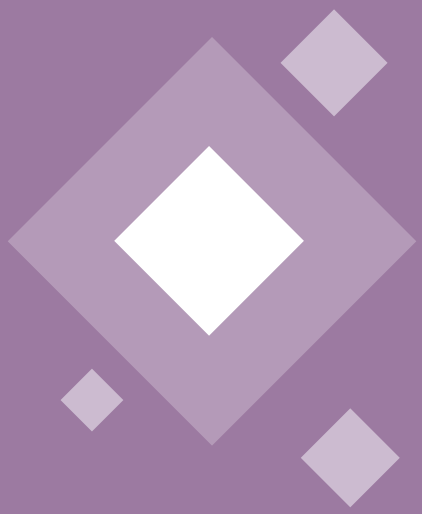
Icons

Cristina Torres, Clockwise, Mister pixel from The Noun Project

Freepick from www.flaticon.com



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