

# COUNTRY OVERVIEW ETHIOPIA

An Introduction to the Country Economy  
and the National Innovation System



## AID 11346 Emerging African Innovation Leaders

G7 Exchange & Empowerment Program  
for enabling Innovation  
within the Next Production Revolution

Work Package 1



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**POLITECNICO DI MILANO**  
GRADUATE SCHOOL  
OF BUSINESS

## COUNTRY OVERVIEW: ETHIOPIA

### An Introduction to the Country Economy and the National Innovation System

This report describes Ethiopia's National Innovation System (NIS) under the lens of the Next Production Revolution (NPR). After summarizing the main characteristics of the country's economy, it introduces the NIS players and institutions that are considered to sustain the diffusion of NPR technologies and business models across the main domestic industries. The report is primarily aimed at introducing all the members of the Emerging African Innovation Leaders project, including trainers and mentors, to the country's economy, its potential for the NPR technologies and the NIS components that can foster the embracement of the NPR in Ethiopia. The report content may also be of interest to local and international policymakers, enterprises and civil sector organizations that are working toward the NPR adoption in the country.

*The document was produced by Fabio Lamperti between April and August 2018 as a researcher of Politecnico di Milano, School of Management. The report is part of a serie of six Country Overviews, which were designed and reviewed by the "Emerging African Innovation Leaders" research team composed by Emanuela Colombo, Paola Garrone, Andrea Gumina, Fabio Lamperti, Boris Mrkajic, Felipe Repetto, Nicolo' Stevanato and Stefano Pistolese from Politecnico di Milano, and Pierluigi Leone and Leonardo Rosciarelli from Politecnico di Torino.*

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## Executive Summary

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This report describes Ethiopia's National Innovation System (NIS) under the lens of the Next Production Revolution (NPR). After summarizing the main characteristics of the country's economy, it introduces the NIS players and institutions that are considered to sustain the diffusion of NPR technologies and business models across the main domestic industries. The report is primarily aimed at introducing all the members of the Emerging African Innovation Leaders project, including trainers and mentors, to the country's economy, its potential for the NPR technologies and the NIS components that can foster the embracement of the NPR in Ethiopia. The report content may also be of interest to local and international policymakers, enterprises and civil sector organizations that are working toward the NPR adoption in the country.

The first Section of the report describes the country focusing on several important aspects (e.g. geography, politics, economy, industry structure, etc.) with the aim of providing an insight of the local situation and to critically understand the starting point for the spreading of the NPR. Specifically, Ethiopia presents a huge potential for growth: Ethiopia is the second most populous country in the African continent and the average GDP growth has been at

double-digits over the last decade. Nonetheless, it still experiences wide disparities in living standards in terms of geography (urban vs. rural areas), economy (roughly 34% of population lives in poverty) and access to basic services. The country is now entering the investment-driven stage of economic development, receiving consistent inward FDIs, also leveraging on the possibilities offered by industrial parks (e.g. Hawassa Industrial Park), and prioritising public investments in the primary sector. This is done in order to achieve a competitive regional/international position while transitioning to a manufacturing-oriented economy. Agriculture and food production remains one of the crucial sectors, while manufacturing of food, textile and apparel industries are gaining importance. Furthermore, the engineering and construction sector has gained more and more importance during recent years, also driven by the fast development of large scale projects, especially in energy production from renewable sources. Overall, Ethiopian performances in terms of development along the three directions of infrastructural development in Energy, Mobility and Digitalization are rather scarce.

Section 2 provide a synthetic but insightful picture of the country's NIS, critically analysing the major categories of actors, their actions and readiness towards the

embracement of the NPR, and the existing linkages and interactions between them. Despite firms, especially belonging to leading manufacturing industries, have been benefitting by several policies, many challenges have prevented a real industrial expansion. Among them, credit accessibility, product and process innovation attitude, international standards compliance, and hence involvement in international production chains have been the most difficult barriers to overcome. Nonetheless, examples of local entrepreneurial attitude still stand, and start-ups leveraging on new digital platforms find space filling the gaps left opened by institutions and international giants. Contemporarily, the Ethiopian policymaker seems to be mainly focused on increasing manufacturing output and exports. The Ethiopian Investment Commission and the Industrial Parks Development Corporation are operating to simultaneously promote inward FDIs and build industrial parks. In so doing, international investors can find ready-to-use facilities, local suppliers and workforce; at the same time, local firms can spill-over know-how and improve internal performances. Nevertheless, the majority of industrial policy prioritise low-tech sectors such as sugar and other agri-food production, textile and garments, and leather products industries. The aim is that of consolidating a strong

economy base upon these sectors, later focusing on mid- and high-tech manufacturing. Concerning Higher Education Institutions (HEIs), science and engineering instruction as well as technical training have been recently, heavily prioritized through a renovation policy of the national education system. This is coherent with the government's line of economic planning; nonetheless, the system is still lacking of attention towards entrepreneurial education, which is fundamental to train the next generation of manufacturing sector's management and workforce. Overall, the NIS remains quite fragmented and still needs time to reach the planned results.

Finally, the third Section has two distinct aims: first, it sums up the major findings around the NIS, deeply exploring few key actors of the NIS, highlighting their degree of involvement, actions and potential to foster the spreading of the NPR in Ethiopia. Secondly, it presents the line of thought and a preliminary version of a "Canvas" ideated to sum up the major findings on the industry structure, the NPR-related potential and the specific learning needs of the country. More specifically, concerning the first part, the Ethiopian Ministry of Science and Technology has been selected as first key actor for its involvement in the economic and social development of the country through science and innovation. Then, Addis Ababa Institute of Technology, Industrial

Parks Development Corporation, Ethiopian Economic Association and iceAddis incubator/accelerator have been selected for their roles in various fields of action within the NIS. In the second and final part, after a critical assessment, five key industries have been identified and cross-analysed with the three NPR-enabling transformation fields of Energy, Mobility and Digitalization. Few example of actions have been proposed, along with a pool of Italian investors operating at these intersections, leaving a full and comprehensive evaluation and Canvas formulation to the AIL project participants.

# 1.

## Country overview

This first Section of the report presents a synthetic but comprehensive overview of the Ethiopian landscape in terms of social, political, economic and infrastructural aspects. The aim is that of providing the necessary information to support the definition and the analysis of the potential scenarios deriving from the diffusion of the Next Production Revolution (NPR).

### 1.1 Recent history

Ethiopia is a **Federal Democratic Republic** located in the Horn of Africa. After a period of instability during which the country was led by a military junta, the first multi-party democratic elections were held in 1995. These elections were won by the Ethiopian People's Revolutionary Democratic Front (EPRDF), which has remained in power ever since.

Since 1991 Ethiopia has established **good relations with the United States and Western Europe** and sought substantial economic support from Western countries and the World Bank (WB). As a demonstration of these strong bonds, in 2007, the Ethiopian army supported the US in the fighting against the Islamic Courts, in Somalia. In the last years, the role of Ethiopia in the fight against Islamic terrorism in the region has been acknowledge internationally.

### 1.2 Geography

The country has a total surface of about 1.1M km<sup>2</sup>, and its land-locked. **Water surface** corresponds to about 9.5% of the total. **Land surface** is made up of agricultural land for 36.3% and of forest for about 12.2%. Ethiopia is **bordered** by Kenya to the south, Somalia to the south and east, Djibouti to the east, Eritrea to the north, and Sudan and South Sudan to the west. **Natural hazards** are generally associated with the presence of the Great Rift Valley, which makes the country susceptible to earthquakes and volcanic eruptions. Ethiopia is also plagued by frequent droughts. Current **environmental issues** include deforestation, overgrazing, soil erosion, desertification and water shortages. Typical **climate conditions** are tropical monsoon with wide topographic-induced variation.

### 1.3 Demography

As of 2017, Ethiopia has a **population** of about 105M people, and the country has experienced an average annual growth rate of 2.7% over the period 2000–2016; however, it has been decreasing during the period. Population is almost all dispersed in rural areas: **urban population** accounts for 19.5% of the total, but it is increasing. In fact, between 2016 and 2017 it grew by 4.9%. According to the latest available



Figure 1. Political map of Ethiopia

data, **life expectancy** is rather low, at 64.6 years. Ethiopian population is extremely young: the share of population between the ages 0 to 14 is 41.1%, whereas the share of population ages 65 and above is just 3.5%. In fact, the **fertility rate** in the country is about 4.6 births/woman, well over developed countries standards. Due to the challenges (war, political instability, famine and economic hardship) that the country has experienced in the last decades, **migration** is not a new phenomenon in Ethiopia. While being a major source of refugees until the '90s, the country became one of the largest transit point and destination of migratory flows in the Horn of Africa. As of 2015, about 15% of all emigrants (753,492 people, not just Ethiopians but especially people in transit from Sub-Saharan Africa) left Ethiopia ahead to Europe, mainly arriving through Mediterranean countries; roughly 33% were directed to Northern America, in particular to the United States.

The highest **population density** is found in the highlands of the north and middle areas of the country, particularly around the capital, **Addis Ababa** (UTC +3). The city has an estimated population of around 3.24M people, and around 5M people in the metropolitan area. There are more than 80 different **ethnic groups** in Ethiopia. Religious groups are geographically

clustered. The official national **language** is Amharic, although English is the most widely spoken foreign language.

#### 1.4 Living standards

Ethiopia's living standards are poor, but improving, sustained by the rapid economic growth and accelerated poverty reduction. Access to improved **water sources** as of 2015 was rather good (57.3% of the population) and rapidly improving, especially due to the improvement in rural areas (48.6%). At the same time, access to **sanitation facilities** was poor, at 28% in both urban and rural areas. **Food** availability as of 2016 was seasonal and rural households tend to be the most affected by seasonal food shortage. Main **shocks** faced by Ethiopians include illness of household member (23% of households), drought (21%), increase in the price of food items (21%) and increasing price for inputs (14%). Overall, the country's poor living standards are confirmed by the UN's Human Development Report (HDR) indicators, which focus on how human development can be ensured for everyone, now and in the future, exploring progresses on many fronts. Ethiopia fares low in terms of **human development**, as it under-performs both with respect to its group peers and to the Sub-Saharan African countries' group along a multitude of dimensions such as economic

### Population 150 M

As of 2017, Ethiopia has a population of about 105M people

### Annual growth rate 2.7%

The country has experienced an average annual growth rate of 2.7% over the period 2000–2016

### Urban population 19.5%

Between 2016 and 2017 it grew by 4.9%

### Life expectancy 64.6 years

Life expectancy is rather low

### Ethiopian population 0-14 41.1%

The Ethiopian population is extremely young, whereas the share of population **who are 65** and above is just 3.5%

## Water sources

In 2015 **57.3% of the population** had access to water. this data is rapidly improving, due to the improvement in rural areas

## Sanitation facilities 28%

The access rate to sanitation facilities is low, in both urban and rural area

## GDP per CAPITA 1,608.3 US\$

Rising by almost 88% during the last decade with about 7.5% constant increase year-on-year.

and social inequalities, women development opportunities and inclusion, multi-dimensional poverty, etc. However, considering households' economics, as of 2016, **GDP per capita** was 1,608.3 PPP constant 2011 international \$, rising by almost 88% during the last decade with about 7.5% constant increase year-on-year. Improving performances are acknowledgeable also looking at **financial inclusion**: compared to regional peers, approximately 22% of Ethiopian adults have accounts from formal financial institutions. At the household level, financial inclusion reaches 35%.

### 1.5 Politics

Ethiopia's 1994 constitution set the country as a bicameral parliamentary federation made up of states delineated according to "settlement patterns, language, identity and consent of the people concerned". This principle configures Ethiopia as an **ethnic federation**. Having won all the elections ever since the first one in 1995, the political party EPRDF exerts a strong power on the Ethiopian **politics**. However, after 2005's elections, opposition parties made significant gains and disputed the electoral results. Subsequent protests resulted in violence between protesters and government

security forces, during which nearly 200 protesters died. A crackdown on opposition parties, independent organisations and media freedoms followed. During the subsequent years a large number of opposition figures and journalists were arrested, coming to 2015 and 2016, when large-scale and unprecedented protests swept through the country. Ethiopian security forces cracked-down on these demonstrations, killing more than 500 people. In fact, **political freedom** in Ethiopia is rather restricted. This is confirmed also by the country's poor performances in the Worldwide Governance Indicators (WGI). Ethiopia ranks around the bottom 10% in aspects such as regulatory quality, political stability, absence of violence, and freedom of expression and association; the country ranks around the bottom 35% as regards to government effectiveness, quality and enforcement of legislative system, and corruption.

### 1.6 Economy

Ethiopian economy's **GDP** was 164.7B at PPP constant 2011 international \$ in 2016, and the country is continuously developing at a fast pace; GDP annual growth rate over the period 2007–2017 has always been above 7.5%. Ethiopian Birr, the national **currency**, has been steadily depreciating against the US\$ since 2007, according to the

country monetary policy aimed at favouring exports via competitive currency depreciation. During the period 2007–2016 the country has always experienced positive annual **inflation** of consumer prices with peaks of 44.4% and 33.2% in 2008 and 2011 respectively, stabilizing at about 8.2% in the subsequent years. **Unemployment**, as a share of total labor force, reached 5.4% in 2017, in line with the average rate over 2007–2017 period. Despite the low unemployment rate, in 2010, the 33.5% of total population lived with less than \$1.90/day (PPP constant 2011 international \$), under the **poverty line**.

Ethiopian **economy competitiveness**, as measured in the Global Competitiveness Report 2017–2018 is rather low, including social, institutional and economic measures, as well as efficiency and innovation factors. The country ranks 108<sup>th</sup>/137, especially lagging behind in infrastructures, higher education and technological readiness. Ethiopia is now going through the transition between the factor-driven stage to the investment-driven stage of **economic development**, decreasingly relying on its most important and resource-based industry, agriculture. In fact, between 2012 and 2016, Ethiopia has experienced growing inward **FDIs**, going from \$278.5M to about \$4B. As regards trade statistics, as of

2016, Ethiopia had a negative **trade balance** of \$17.3B in net imports. **Exports** of goods and services as a share of GDP have declined in the last years, going from 13.8% in 2012 to 8% in 2016. The top **export destinations** of Ethiopia are the United States (\$169M), Saudi Arabia (\$167M) and Germany (\$148M). Exports, at 4-digits aggregation level, are led by Coffee which represent 41.2% of the total exports of Ethiopia, followed by Dried Legumes, which account for 14.5%, and Gold accounting for 7.5%. On the other hand, the top **import origins** of Ethiopia are China (\$3.21B), India (\$830M), the United States (\$826M). Imports at 4-digits aggregation level consist mainly of Refined Petroleum (10.1%), Delivery Trucks (4.2%), and Packaged Medicaments (3.3%). Among **G7 member countries**, Ethiopia has major economic ties with the United States (9.9% of exports; 8.8% of imports) and Germany (8.7% of exports). Italy and Japan account respectively for 3.4% and 3.5% of Ethiopian exports, and for 4% and 4.2% of imports. Minor ties exist with France and the United Kingdom. Ethiopia is signatory of four **trade agreements**. The most important one is the Common Market for Eastern and Southern Africa (COMESA) free trade area including nineteen member countries with the common goal of strengthening market integration

## Unemployment

5.4%

As a share of total labor force, reached in 2017

## Economy competitiveness

108<sup>th</sup>/137

The country especially lags behind in infrastructures, higher education and technological readiness.

## Import/export

Among the G7 member countries, Ethiopia has

### United States

Exports	Imports
9.9%	8.8%

### Germany

Exports
8.7%

## Agriculture

As of 2016, accounts for

**37.2%**

of GDP, about

**73%**

Exports

**70.9%**

of Total Employment

## Industrial sector

From 2012 to 2016,  
industrial sector **share of GDP**  
jumped from

**10.3% to 21.3%,**

with related employment  
accounting for

**8.3%**

in 2016.

## Exports of high-tech products

As a share of exports  
of manufactured goods  
increased from

**2.5%**

in 2012 to

**17.2%**

in 2016,

reaching a total value of

**\$29.8M**

in 2016

and economic infrastructures, attract increasing investments, boost industrialization and foster social and human capital development. About 5.4% of imported goods face no duty, the maximum rate is 35%, and the weighted duty average is 12.1%. However, in East Africa, over 95% of cross-border trade is through unofficial channels, hence it is often beyond state control and regulation.

### 1.7 Industry structure

Ethiopian industry structure is strongly focused on **agriculture**; however, following a wave of privatizations started in the late '90s, the country experienced a boost in **manufacturing** sector growth. Nevertheless, many key sectors for development of the Ethiopian economic system, as banking, telecommunications and transportation, remain state-owned.

As of 2016, **agriculture** accounts for 37.2% of GDP, about 73% of exports, and 70.9% of total employment. However, Ethiopia is becoming decreasingly reliant on agriculture starting from 2012, with a drop of 22.5% in the sector share of GDP. However, there was just a 1% drop of sector's employment, probably highlighting a loss of competitiveness due to droughts. The country has experienced a strong boost in the **industrial sector**: from 2012 to 2016,

industrial sector share of GDP jumped from 10.3% to 21.3%, with related employment accounting for 8.3% in 2016. In particular, the **manufacturing** share of industrial sector increased from 3.7% to 4.3% during the same period, with exports of manufactured goods reaching 9% of total exports in 2016. Further breaking down the manufacturing contribution to GDP it can be observed that food, beverages and tobacco industries (grouped together), as well as those producing wood, paper, petroleum, basic metals, mineral products and fabricated metal products (grouped as "other manufacturing" in WB data) respectively account for around 37% and 38% of manufacturing. Moreover, medium and high-tech sectors, including construction industry contribute for about 16% to overall manufacturing value added; textile/clothing and chemical industries both account for around 10% of manufacturing. Notably, **exports of high-tech products** as a share of exports of manufactured goods increased from 2.5% in 2012 to 17.2% in 2016, reaching a total value of \$29.8M in 2016, and highlighting the attention that this sector is receiving, and that the economy must develop not leveraging just the cheap labour.

As regards Ethiopian **service** sector, the share of GDP associated has remained constant over the

period 2012–2016, accounting for about 41.5%. The sector share of total employment has slightly increased, over last years, settling at about 21% in 2016. Manufacturing and service industries are still in their infancy stage, hence there resides a huge potential to boost growth in the Ethiopian economy. Examples such as that of Hawassa Industrial Park must lead the way of this

*Ethiopia has geological potential for the discovery of new, sizeable oil, gas and mineral deposits*

development wave in the country. Despite having a huge potential to contribute to the country economy, the **development of oil, gas, and mineral resources** are not among the key drivers of the country's growth. Although Ethiopia has geological potential for the discovery of new, sizeable oil, gas and mineral deposits, most of its extractive industry is still in its infancy stages. However, already in 2012, mining was responsible more than 19% of the total value of exports. Hence, it is crucial to develop this sector as

it can be an important source of inward FDIs and job creation.

**Value added per worker** in agriculture has increased by 13.3% between 2012 and 2016, with an average yearly increase of 3.2%. This is explained by an increase in the sector's productivity which is not reflected in the overall sector performances due to the outpacing rate of Ethiopian GDP expansion. In the industrial sector, value added per worker has increased by significant 80.7% during the period, about 8% year-on-year average increase. Finally, value added per worker in services increased by 22.5% from 2012 to 2016. **Labour productivity** in Ethiopia is generally considered to be low despite the improvement in the recent years; GDP per person employed has experienced a strong growth, reaching 3,599 PPP constant 2011 international \$ in 2017.

Overall, exports of agricultural and manufactured goods, along with fuels exports (11% of total exports) constitute a major shares of Ethiopian total export of goods, at aggregate level. At 6-digits aggregation level, the **key strategic products** in Ethiopian exports are Unroasted and Decaffeinated Coffee (41% of exports), Semi-Manufactured, Non-Monetary Gold (7.5%) and Kidney Beans and White Pea Beans Dried Shelled (6.3%). Again, this breakdown shows the outstanding importance of

**Value added per worker**

increased by

**13.3%**

in agriculture

between 2012 and 2016, with an average yearly increase of

**3.2%**

**key strategic export products**

**41%**

Unroasted and Decaffeinated Coffee,

**7.5%**

Semi-Manufactured, Non-Monetary Gold,

**6.3%**

Kidney Beans and White Pea Beans Dried Shelled.

Exports of high-tech products

*Natural resources consist of small reserves of gold, platinum, copper, potash, natural gas and hydropower*

agricultural sector.

As in many other low-income countries, registration of **informal economic** units in Ethiopia is low, and as a result most of them remain outside the purview of government policies, especially with respect to labor and taxation. As a result of highlighted low quality of governance and institutional development, micro-businesses are often incentivized to keep their activities out of the formal sector and they might be a factor underlying the sizeable underground economy in Ethiopia. In fact, as of 2013, the share of labour force in the informal sector was estimated at 22.8%.

### 1.8 Natural resources

**Natural resources** consist of small reserves of gold, platinum, copper, potash, natural gas and the potential to exploit hydropower. As anticipated the mining sector is among the untapped one, representing a potential engine of growth for Ethiopia. In fact, **natural resources rent** as a share of GDP has declined during the period 2011–2015, going from about 18% to 14.3%. However, the \$ value of the rent increased over the same period, highlighting once more the importance of not looking just at GDP share measures when analysing countries experiencing strong growth.

According to the Ethiopian Ministry of Water Irrigation and Electricity, the country is strongly

focused on the utilisation and production of **renewable energy**. The potential grid generation capacity from renewables is estimated to be notably high: 45 GW from hydropower, about 10 GW from geothermal, and estimates from wind and solar energy are even higher. Cumulated production capacity of the grid, up to 2015, comes especially from hydro sources, but wind and geothermal sources are also relevant. Total electricity production that amounted to about 5 GW in 2015, more than doubled reaching around 12 GW in 2017 thanks to the completion of the Grand Ethiopian Renaissance Dam. Ethiopia is currently a major **exporter of renewable energy** to the eastern Africa region (second after Mozambique, in 2014). However, in order to sustain future growth (forecasted to settle around 30% per year) of domestic and international demand, major investments in hydro, solar, wind and geothermal energy production are planned for the period 2016–2020.

### 1.9 Smart and integrated infrastructures

As quality infrastructures are essential to open up to the potential of economic development, it is crucial to assess their readiness, quality, and actual performances in Ethiopia. The Logistics Performance Index

(LPI) provided by the WB is commonly used as a benchmark for countries and to help them identify the challenges and opportunities on trade logistics. Ethiopia ranks 126<sup>th</sup>/160, lagging behind in all components of the index, but lacking especially of infrastructures and on traceability competencies and tools. These performances are also reflected by the Africa Infrastructure Development Index (AIDI) from the African Development Bank (AfDB), according to which Ethiopia ranks in the bottom 10% of African countries. State of the art for specific infrastructures is presented in the following Sections.

### 1.9.1 Energy

Energy provision is a key factor enabling the fast spread and development of a competitive industrial apparatus aiming to leverage on the Next Production Revolution (NPR). Still, some barriers to the achievement of this potential exist in Ethiopia. Access to **electricity** as of 2014 was rather low, at 27.2% of total population, with extreme disparities between urban (92%) and rural (12.2%) areas. In fact, Ethiopia ranks low in the 2017's Energy Architecture Performance Index by the World Economic Forum (WEF), but showing high performance in the **environmental sustainability** indicator (0.88/1 score) even outperforming most of developed

countries. However, the quality, as well as the security of the energy supply are still low, as also confirmed by the Global Competitiveness Index (GCI) by the WEF (Ethiopia ranks 104<sup>th</sup>/138).

Ethiopian value added lost due to **electricity outages** as a share of firms' sales has increased from 4.3% in 2011 to 6.9% in 2015, with 80% of firms experiencing electricity outages for an average duration of about 6 hours per day. This is mostly due to the difficulties for grid expansion projects to keep the pace with the fast growth rate of the economy. However, the most recent production capacity expansion projects which leverages renewable resources highlight the commitment that the government is putting in policies and investments in the energy grid. As reported by local interviewees, latest government successes in this field should bring to a decline in the lost value added due to outages and to lack of quality.

### 1.9.2 Mobility

As well as energy grid, also transportation infrastructures are crucial to build up the fundamentals of Ethiopian future value chain: it will give fuel to domestic growth, as well as to that of the whole region. As of 2015, Ethiopia was covered by

## Logistics Performance Index

126<sup>th</sup>/160

Ethiopia lacks especially of infrastructures and on traceability competencies and tools

## Access to electricity

27.2% (2014)

of total population can access electricity.

### Extreme disparities

between urban

92%

and rural

12.2%

## Roads

110,414 km

of roads in 2015

with only the 13% of which were paved

14,354 km

110,414 km of **roads**, with only the 13% of which were paved (14,354 km), located especially in the capital Addis Ababa and in other urban areas. Roads quality evaluated by the WEF position the country 83<sup>rd</sup>/138, highlighting the necessity for the government to focus on road infrastructure projects that can actually increase connectedness between firms and trade corridors.

The country **rail** transport system (National Railway Network) is mostly in planning and construction stage, currently consists of four electrified railway lines. Since Ethiopia has no ports, the most important railway is the Addis Ababa–Djibouti Railway, which connects directly the capital with the Port of Djibouti, in Djibouti. In fact, the **port** acts as primary Ethiopian port. Overall, rail transport quality is good, and the country ranks high, at the 48<sup>th</sup> position in the GCI. During latest years, the Ethiopian government is considering a priority the development of the national railway system, showing a high commitment also in terms of investments.

Up to 2015, 57 **airports** are registered in Ethiopia, 17 of which with paved runways, but just 2 of them connect to international destinations. Registered carrier departures worldwide increased from about 62,000 to about 95,000 between 2012 and 2016; air transport freight as measure

in M ton-km went from about 704 to 1,490 during the same period. Quality of air transport infrastructures is rather low in the GCI: Ethiopia ranks 105<sup>th</sup>/138.

### 1.9.3 Digitalization

Digital connectedness is another major indicator of the quality and readiness level of infrastructure necessities for the advent of the NPR in Ethiopia. As a matter of fact, during the period 2012–2016, internationally public data

*During the period  
2012-2016,  
internationally  
public data  
shows significant  
improvements  
in the country's  
digital ecosystem*

shows significant improvements in the country's digital ecosystem. The number of **mobile cellular subscriptions** have more than doubled, reaching a total coverage (51.2M) of about half of Ethiopian population. **Fixed broadband subscriptions** have skyrocketed over the same period, passing from a total number of about 8,500 to about 560,000 subscriptions (about 0.5% of total population). The share of **population with internet access**

has raised by about five times during the five years coming to 2016, starting from 2.9% and reaching 15.4% of Ethiopian population. As of 2015, **average internet speed** was about 2.2 Mbps. However remarkable are the improvements showed by available data compared to the period prior 2012 and to other Sub-Saharan countries, they still are not sufficient to define Ethiopia as a digital-ready country. Reports from local interviewees suggest that the state-owned ICT and Telecommunication industry is lagging behind and the real diffusion of digital infrastructures is not receiving the right attention. Scarce quality and shutdowns reflect on effective usage by discouraging people and business to leverage on the advantages of the digital era. It is clear that actual performances must be further improved in order to reach digitization standard required by the newest production technologies. In fact, also according to the GCI, Ethiopia ranks among the bottom positions in terms of quality and diffusion of digital infrastructures.

### 1.10 Human capital

Recently, Ethiopia's Ministry of Education has developed and implemented several policies aimed at improving the country's educational system, in line with the economic development strategy and targets. However,

data available are not updated. As of 2007, overall **literacy** among the population aged 15 and older was at 39%, showing a peak of about 49% in the case of male literacy. Youth literacy (people aged 15–24) was higher, at 55%. In particular, female literacy rate increased sharply between 2005 and 2007, by 41.3%, reaching about 47% among young women. In Ethiopia, **compulsory education** lasts 8 years from

*The country is among those showing worst performances in terms of completion rates*

age 7 to age 14. School life expectancy is 8.4 years; hence a narrow share of the population goes on in the education path over the compulsory period. As of 2015, gross **enrolment rate** in secondary and especially in tertiary education were rather low, respectively at 35.1% and 8.1%. **Graduates in science and engineering** as a share of tertiary education graduates were 11.2% prior 2016. According to UNESCO, the country is among those showing worst performances in terms of **completion rates**: only about 13% of population enrolled

## School attainment

**8.4 years**

a narrow share of the population goes on over the compulsory period

## Graduates in science and engineering

**11.2%**

As a share of tertiary education

## Global Entrepreneurship Index

**110th/137**

The country ranks are low regarding entrepreneurial resources and infrastructure

## Entrepreneurship perception

**65%**

people who perceive good opportunities in starting a firm in Ethiopia

## Latent Entrepreneurship

**24%**

of population aged 18–64 intend to start a business within 3 years

in primary education complete the studies, this measure going to about 40% for secondary and higher education.

Most recent data on **government expenditure in education**, expressed as a share of total government expenditure corresponds to 2013, settling at 27%. Expenditure in education accounted for the 4.5% of GDP. Employment in knowledge-intensive sectors is rather difficult to estimate; however, Ethiopian latest estimates on **FTE researchers** amounted to 45.1 per M people, according to UNESCO. This data is relatively low if compared to the average among Sub-Saharan countries over the same period (93.4 FTE researchers/M people).

### 1.11 Entrepreneurship

Ethiopia's Growth and Transformation Plan (GTP) seeks to bring about broad-based transformative structural changes, necessities to boost economic growth in the country. GTP emphasizes the need to provide comprehensive support to new businesses and entrepreneurial attitude. These necessities are reflected by Ethiopia's low rank in 2018's Global Entrepreneurship Index: the country ranks 110th/137 when measuring entrepreneurial **resources and infrastructure**. As regards the entrepreneurial context, according to the WB, Ethiopia

positions 161st/190 in overall easiness of **doing business**, lagging behind especially in credit availability, protection of minority investors and insolvency issues.

Entrepreneurial **attitude and behaviours** are complex criteria to assess, especially to monitor over time; hence, update data are not available. Latest information refers to 2012, the percentage of people who perceive good **opportunities** in starting a firm in Ethiopia is good, at 65%. The share of citizens who think they possess the capabilities is even larger, reaching 69.1%. The share of working population who considered **latent entrepreneurship** and who intend to start a business within three years is about 24% of population aged 18–64. These data suggest that the already present and high entrepreneurial attitude should be complemented with specific skills in order to help businesses either to transit from the informal to the formal economy or to scale up and create new jobs and welfare.

### 1.12 Science, research and innovation

As far as innovation and research are concerned, Ethiopia is clearly lagging behind, needing to boost its activity and requiring focused policies. During the five years coming to 2013, gross domestic **expenditure in research and development** (GERD) almost

tripled reaching 0.61% of GDP. GERD performed by **business enterprises**, as a share of GDP was about 0.2%; the 0.9% of total R&D expenditure was financed by businesses themselves, whereas the 3.6% was financed from abroad. The 4.4% of Ethiopian firms spent on R&D, and the 32.6% introduced process innovations in their business. However, just the 7.7% of businesses adopt technology licensed from foreign companies; this limiting the potential for knowledge absorption.

*There is  
a growing trend  
towards the  
creation of  
knowledge  
clusters*

According to the Global Innovation Index by the World Intellectual Property Organisation (WIPO), **collaborations** between firms and universities or research institutions is rather good in Ethiopia, as well as there is a growing trend towards the creation of **knowledge clusters** deriving from the geographic concentrations of firms, suppliers, producers, and specialized institutions supported by UNIDO's Cluster Development Programs. During recent years, all the **patent- and trademark-related**

**activity** is associated to Ethiopians residing abroad. Notable patenting activity was limited to 2015, with 19 applications and 17 grants. Trademark activity was far more consistent during the years 2007–2016. In the same time frame, Ethiopian contribution in production of scientific and technical journal articles strongly increased, going from 309 to 1,121 publications, an average yearly increment of 9.8%. Overall, Ethiopia ranks 110<sup>th</sup>/127 in the Global Innovation Index (GII) by WIPO.

# 2.

## Institutions of the national innovation system

In the following Section, an overview of the main categories of actors constituting the Ethiopian National Innovation System (NIS) is developed, presenting the key information related. Then, the linkages between the highlighted institutions are explored, always keeping a NPR-enabling standpoint.

### 2.1 Firms

Whereas the magnitude of the industrial and manufacturing sectors remains of concern if looking at their contribution to GDP, they are receiving great attention by national institutions as they are the key to boost future growth for Ethiopia. However, evidence from firm-level surveys and studies uncovers several challenges that may slow down the rate of industrial expansion. The average firm-level **investment rate** is about 12% of the capital stock. Even if the degree of firms' financial literacy, as reported by the WB (529 manufacturing firms out of 848 surveyed Ethiopian firms), is high (the 92.6% has a checking or savings account, about the 33% has active bank loans or lines of credit), **access to credit** is one of the major difficulties new firms face in Ethiopia. In fact, about 86% of active loans require collaterals, with an average value of about 300% the value of the underlying loan. Overall, about 15.1% of loan applications are rejected. Such constraints result in only the 12.9% of private investment

being financed by banks, and this situation seems inconsistent with the emphasis placed on manufacturing sector by the GTP. Moreover, as there are growing evidences on correlation between increasing economic prosperity and the pace at which new products are added to the economy's **basket of goods**, the topic of product offering enlargement by Ethiopian firms gains importance. Multi-product firms account for about 34% of manufacturing firms and 42% of manufacturing sales; but the addition of a new product is strongly associated with spot investments, which suffers by credit constraints. Finally, another major challenge for Ethiopian manufacturing is the ability to create **new jobs**. Most of the job creation in the sector actually occurs among large firms, as SMEs tend to create job only at the market entrance, then failing to scale up in size.

Available data on manufacturing firms confirms these issues, which then results in just 8.5% of firms exporting directly or indirectly. Moreover, looking at involvement in **international production**, just the 36.7% of firms use material inputs and/or supplies of foreign origin, probably highlighting a low degree of participation in global value chains (GVCs) by Ethiopian firms. However, this could not be the only interpretation: a low usage of foreign inputs could also signal that local production chains strongly rely on Ethiopian

suppliers, assuming these have higher price competitiveness compared to foreign ones. Another factor to consider is the scarce quality of **transportation infrastructures**, logistic practices and skills, that might represent a barrier for Ethiopian firms to engage in international trade. In fact, whereas foreign MNEs operating in the country leverage on the few logistic providers available locally and more frequently internalize logistics, local firms

### *Ethiopian firms lack of capital for investments and in longterm strategic vision*

frequently adopt informal ways of transporting their goods. Hence, it is really difficult to keep track of the impact of existing (and most likely, also improvements in their conditions) infrastructures on Ethiopian firms. Clearly, another firm-level topic to tackle in order to foster participation in GVCs is that of catching up with international **standards** and quality-related certifications.

Ethiopian firms not just lack of capital for investments, but in most cases they also lack long-term **strategic vision**. As many basic infrastructures are not

available, or they are available with considerable constraints, the starting point to allow firms engaging in long-term objectives is to support them with long-term policy support and investment in infrastructures. The same applies to **innovation**: as a radical innovative attitude is also associated with a risk-taking attitude, in the case of Ethiopian firms, this clearly implies that the innovation resides almost completely in slow and small process/product innovations. However, cases of success open up the belief that, with more innovative and direct policies and approaches, Ethiopian policy makers can succeed in stimulating investment and innovation in SMEs.

Addressing high-tech firms and start-ups, there still are important barriers to overcome. Above all, telecommunications and banking sectors are monopolies driven by the government, and are subject to considerable censorship, which results in relatively low internet penetration. However, these barriers might create compelling scenarios too. An example is the transportation system in Addis Ababa: while the city experiences a boom in the building sector, and Ethiopia is bound to be the second African country with a metropolitan system after South Africa, the surface taxi transport is lagging behind. Ethiopia remains one of the Uber's last major frontiers due to government restraints, even if an urban middle class equipped

**Hawassa Industrial Park**  
 inaugurated in 2017

**140**  
 hectares of factories  
 a water treatment plant  
 own textile mill

**10,000**  
 jobs created

**60,000**  
 jobs expected

**\$1B**  
 in exports by the end  
 of 2018.

with the latest smartphones is rapidly growing. If, on the one hand, state-owned sectors keep aside international giants, on the other hand, it opens up for local substitutes to arise. This is the case of three local start-ups (ETTA, Zayride and RIDE) that are hoping to modernize the capital's archaic taxi system.

## 2.2 Government

Currently, policymakers in Ethiopia seem to be focused primarily on increasing manufacturing output and exports. One such initiative is the establishment of major **industrial zones** around Addis Ababa, such as Bole Lemi industrial park funded in part by the WB. These facilities (the production of which is supervised by the Ethiopian Investment Commission (EIC) and implemented by state-owned enterprises such as the Industrial Parks Development Corporation (IPDC)) are intended to provide investors with readymade factory sites, basic utility services, and are particularly attractive for foreign firms who may not be familiar with the local bureaucracy and business practices. Similarly, the Kilinto industrial zone will host firms in the agro-processing, food, beverage and pharmaceutical industries. The already mentioned Hawassa Industrial Park, inaugurated in 2017 with its 140 hectares of factories, a water treatment plant and its own textile mill, is the biggest industrial park

in Africa. It already created 10,000 jobs, and it is expected to generate 60,000 jobs and \$1B in exports by the end of 2018. Industrial parks have the final aim of clustering together local firms and foreign MNEs in a way that the former can learn the best business practices and efficient operational routines while becoming local suppliers of the latter. These efforts highlight a clear strategy aligned with national development goals, integrated with

*Policymakers in Ethiopia seem to be focused primarily on increasing manufacturing output and exports*

careful planning, and high-level leadership and coordination. In fact, the attraction of high quality long-term investments by world-class companies is considered a cornerstone by the Ethiopian government to foster **know-how transfer** on business aspects like supply chain build-up, compliance and standards. These technology transfers and experience gains will allow an acceleration of home-grown industrial activity, eventually bringing the Ethiopian economy to produce more value. However,

according to internationally available reports, so far Ethiopian policymakers have been focused more on economic growth and job creation through **FDIs attraction**, and privately-owned local firms do not seem to feature prominently in Ethiopia's industrialization process. The Government of Ethiopia has prioritized a few industries to lead its ambitious **industrialization agenda**: sugar, textile and garments, and leather products industries. These sectors' expected linkages with the agricultural sector and the desire to exploit the country's potential comparative advantage in labor-intensive products are the reasons behind **prioritization**. Indeed, these **low-tech industries** are expected to be exported-oriented in order to generate the financial resources needed for capacity expansion in other manufacturing industries. Hence, as of today, direct support to domestic high-tech firms is still out of scope, and most of existing realities are ICT- and not digital manufacturing-driven. However, Ethiopian policymakers should devote the right attention and build sustainable policies to ensure future growth also looking at the **infrastructure** side. If, on the one hand, energy provision and distribution, even if still poor, are improving thanks to both recent and planned projects for capacity and grid enlargement, on the other hand the deficit in road and rail connectivity is still large. It

requires selectivity in investments, as well as a better management strategy for existing assets in order to develop trade corridors both for imports, but especially for exports. As highlighted by the WB, private sector businesses in general, but especially in the wholesale market, should be supported by Ethiopian institutions as improvements in service provision in cold storage, and wholesale-related transportation logistics (traditionally characterized by a high level of capillarity) could lead to overall improvements in infrastructure quality.

Analyzing business enabling/facilitating policies, the Ethiopian government offers a comprehensive set of fiscal and non-fiscal **incentives** to encourage investment into priority areas. Few examples are: customs duty exemptions of up to 100% on imports of capital goods for eligible areas of investment; income tax exemptions for a period ranging between 1 and 9 years; Ethiopian government will cover 30% of the cost of infrastructure (access to road, water supply, electricity, telephone lines) for investors investing in the industrial zone development, and several others also favoring exporters. Hereafter, the key **governmental institutions** which actively operate for the economic growth of the country are briefly introduced:

- The already mentioned EIC is an autonomous government

## Ethiopian higher education system

63

Institutions, between  
Universities  
and Colleges

*The Ethiopian government offers a comprehensive set of fiscal and non-fiscal incentives to encourage investment into priority areas*

institution accountable to the country's Investment Board, which is chaired by the Prime Minister, and has the primary goal of promoting the country's investment opportunities and conditions to foreign and domestic investors.

- The Ethiopian Development Research Institute (EDRI) is a semi-autonomous research think-tank engaged in economic research and policy analysis, capacity building, knowledge dissemination and exchange, and consultancy.
- The Ministry of Science and Technology (MoST) host the Science and Technology Information Center (STIC), aimed at creation and dissemination of scientific knowledge enabling rapid learning, adaptation and utilization of effective foreign technologies.
- Other relevant governmental institutions are the Ministry of Water, Irrigation and Electricity (MoWIE), the Ministry of Communication and Information Technology (MoCIT) and the Ministry of Transport (MoT) which are involved at different levels in the process of creating and sustaining capacity and skills, fundamental for the NPR.

### 2.3 Universities

The Ethiopian higher education system is composed of 63 institutions, between **universities**

and colleges, awarding degrees to their students. This nation-wide system of higher education institutions (HEIs) is quite recent: in 2007 there were just 7 existing universities, and several others were under construction; hence, the system boomed only recently. Most of HEIs are **government-owned**, in particular governed by the Ministry of Education (MOE) and other governmental institutions. The **size** of the universities is extremely variable, mostly depending on the size of the host city and on the population living in neighbor areas. It ranges from few thousands to even about 50,000 students in the case of Addis Ababa University (AAU); however, the average size is between 20,000 and 25,000 students. Almost all universities offer multiple programs focused on a wide range of **disciplines** such as Engineering, Technology and Science, Economics and Business, Natural Sciences, Social Sciences, Healthcare and Medicine, Arts, and Laws. Whereas all of these institutions offer undergraduate programs in these disciplines, only few of them offer post-graduate Master's programs, and even fewer Doctoral programs. Concerning quality of education and performances of Ethiopian HEIs, if looking at the Times Higher Education's World University Rankings, none of them is mentioned neither among the best universities in Africa nor among the World University Rank 2018.

**Research activity** is mainly related to economic and industrial applications, hence it is mostly related to agricultural technologies, processes, and bio-technologies. This is confirmed by UNESCO data: FTE researchers in agricultural sciences represent the vast majority (45.9%), whereas only the 7.1% have an engineering and technological background. Relatively to the employment of this research workforce, the majority (56.4%) of FTE researchers are employed in government agencies or institutions. This situation highlights also an urgent need for attention by Ethiopian government towards **entrepreneurial formation** by HEIs: entrepreneurship education is in its early phase of development in universities. As already mentioned, a higher innovation rate by firms is associated with a higher risk-taking attitude, and this is one of the major shortcomings of the domestic business ecosystem. But, a fortiori, a higher risk-taking attitude is directly associated with the development of an entrepreneurial culture and competencies; hence, it is paramount to improve entrepreneurial knowledge offering in HEIs. Apart from higher education and coherently with the current focus of government industrial policies, during the last few years, Ethiopia has been implementing Technical-vocational Education and Training (TVET) programs. As part of GTP policy, this **vocational education**

has the aim of creating competent, flexible, innovative and self-reliant workforce able to contribute to the economic and social development of the country. TVET institution can be both government and non-government managed. Eligibility for access to TVET is given according to centrally organized examination that students in grades 10 and 12 have to take. Students who pass the exam in grade 10 can continue to preparatory school while the others can pursue TVET or join the labour force. The MOE determines score thresholds for the examination in such a way that the number of students corresponding to a segment eligible for TVET is equal to the capacity of TVET colleges. This centrally coordinated scheme aims at strategic allocation of students to those specializations that the government believes are necessary to develop key industries (in fact, those already mentioned, and not directly associable with the NPR). However, recent analysis on the Ethiopian vocational education system shows contrasting findings: on the one hand, following international best practices, the quality and the number of TVET graduates has increased steadily in recent years; on the other hand, the increase in the number of graduates is being increasingly associated

### Size of universities

between  
20,000  
and  
25,000  
students

Researchers in  
agricultural  
sciences  
45.9%

Researchers in  
government  
agencies or  
institutions  
56.4%

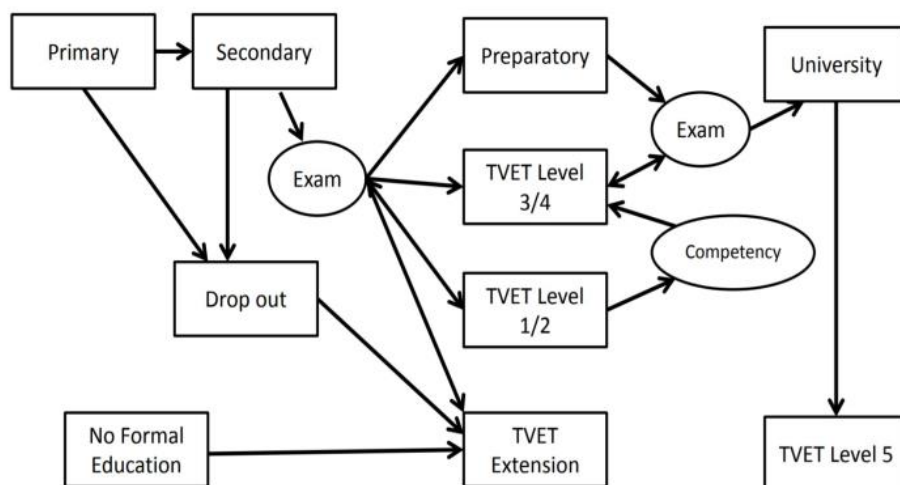
with a reduction of the probability of finding a job. *Figure 2.1* present the scheme of the overall education system in Ethiopia.

## 2.4 Innovation and enterprise support institutions

Support institutions are also present in Ethiopia. The WIPO identifies the so-called “**Technology and Innovation Support Centers**” (TISCs). These entities consist of universities, governmental agencies, other international institutions’ offices providing innovators with access to locally based, high quality technology information and related services, helping them to exploit their innovative potential and to create, protect and manage their intellectual property (IP) rights. Their mission is of extreme importance with respect to the NPR, being among

the key enabler subjects able to boost local entrepreneurship. In Ethiopia, the WIPO recognizes 10 independent TISCs. Moreover, to have a complete picture of the local **entrepreneurial environment** and a better understanding of which could be the future initiatives and best practices that will eventually emerge within the NPR, it is useful to analyze the ecosystem of accelerators, incubators and company builders in Ethiopia. The 5 major players are all located in Addis Ababa. 3 of them are focused on agribusiness start-ups (2 incubators and 1 government-supported accelerator).

The remaining 2, both incubators, offer support, mentorship and even funding mainly to high-tech start-ups. In addition to these, professional associations such as the Ethiopian Economic Association (EEA), which is a not-for-profit,



*Figure 2.1 - Structure of Education and TVET System*

**non-governmental organizations** (NGO), support formal domestic businesses of any size by providing research support and organizing short term trainings on several different issues (new theories, analytical methodologies, findings, and additional information from authoritative personalities) that are of critical importance to Ethiopia's economic development. Finally, also **other NGO** like Enterprising Ethiopia are involved in supporting innovation spread in the country by operating at the "lower level" of the economy. They work with young people, giving them the skills and entrepreneurial initiative to get the jobs that do exist and to create jobs by starting their own growth businesses. The main aim is to help alleviate poverty, giving the basic and necessary knowledge, also to shift from the informal economy to the formal one. However, indifferently from the focus level on local business, NGO generally provides support, knowledge and skills which are very prerequisites for the advent of the NPR.

## 2.5 Linkages between the institutions

The links among the above presented actors of the National Innovation System (NIS) are strongly dependent on the presence and actions of the government. Concerning **inter-firm relationships**, supplier-buyer links in Ethiopia are generally short and fragmented ones, as

confirmed by the WB enterprise survey. Moreover, as firms' internal technological capabilities are weak, the innovation spurring by the inter-firm interactions is therefore limited. Recent government actions related to the creation of industrial parks aim at facilitating the colocation of local firms between them and with foreign MNEs. This is intended to eventually build stronger supplier-buyer relationships both between local and international players. This situation is facilitated by the provision of quality infrastructural services, the lack of which would otherwise act as a strong barrier to supply chain relationship building between local businesses. The other side of the coin is that this management strategy of the relationship between **government and firms** clearly allows the former to keep control on the development of the domestic industrial tissue, shaping the production processes and channeling produced goods towards specific end-markets, determined by the pro-inward FDIs industrial policy. Incentives which benefit relatively more international companies than local firms and round tables organized prevalently with foreign representatives represent some examples, but it is not fully clear if this first step aimed at attracting foreign capital and know-how will be followed in the coming years by import substitution policies to foster local industrial development. The

prioritization of specific industries is meant to foster economic growth by starting from the ones that presents clear advantages. However, the tight control over the ICT and Telco sectors heavily penalize both local and international flows of information, eventually preventing business opportunities, constraining the development of fundamental linkages.

Another major channel leveraged by the Ethiopian government to

*Latest education reforms have been very successful in gathering the experience from Western countries*

achieve its development goals is that of education and training. The relationship **government-education system-firms** goes mainly top-down, and it eventually has direct implications on the latter, especially as far as TVET is concerned. As a matter of fact, latest education reforms have been very successful in gathering the experience from Western countries relatively to both HEIs and TVET. This has contributed to heavily reduce the gap between demand for research and job positions and actual supply. The focus on the development of a renewed and

advanced agricultural sector is confirmed by the predominance of researchers in that field, the existence of several research institutes focused on agricultural R&D, and, consequently, a consistent amount of related research output. Research output having a strong industrial/manufacturing relevance seems to have a limited impact on the creation of concrete business-university links, mainly consisting of innovation and structural analysis.

Finally, **supporting entities** frequently act as facilitators of the relationships between the three analyzed institutions of the NIS. Economic associations and chambers of commerce should make it easier for firms to gather together, helping to create links among themselves, transfer innovation and scale up. However, the extent to which this happens in reality is not easily assessable. Other supporting institutions like NGOs, development and innovation support centers, incubators and accelerators contribute to reduce the existing gap in entrepreneurial skills development and in access to technological infrastructures and knowledge between demand/necessity from businesses and provision by the education system.

# 3.

## Conclusions

Leveraging on the assessment carried out in Section 2, this concluding Section presents a synthetic overview of the most active and relevant actors within the NIS of Ethiopia. Specifically, they have been analysed considering their actual commitment in the process of country innovation, and their potential role in fostering the diffusion of the NPR in the country. Merging the key highlights from the economic analysis in Section 1 with the critical considerations spurring from Section 2 and the first part of Section 3, a framework to synthesize opportunities and challenges deriving from the NPR, actual learning needs for the Emerging AIL project participants, as well as potential actions to be taken, has been formulated and presented to make sense of the analyses carried out all along the report.

### 3.1 Key actors in the national innovation system

Initially, a range of institutions has been identified to constitute the NIS of Ethiopia. Then, a number of key stakeholders were short-listed as the most active institutions as well as the institutions with most potential for making the necessary change to move Ethiopia toward the NPR. The objective was to identify at least one stakeholder per group of NIS actors (firms, government, universities, support institutions). As criteria, we

used the following: (i) publicly communicated stakeholder's mission scope and objectives, (ii) available information on the stakeholder's activities and effectiveness, and (iii) interviews with experts familiar with the Ethiopian NIS stemming from author's professional network. In particular, the reason for inclusion as well as the main objectives, activities and achievements of each institution are elaborated in the following Sections.

#### ***3.1.1 Ethiopian Ministry of Science and Technology***

The MoST is a governmental institution that was first established 1975 and, starting from 2008, the Agency was upgraded as one of the Cabinet ministries, becoming directly accountable to the prime minister and the council of ministers. The main aim of the Ministry is to encourage, support and coordinate any kind of science and technology initiative in order to foster the Ethiopia's economic and social development. To accomplish this long-term objective, MoST's mid-term vision is to boost the development of capacities enabling rapid learning, utilization and adaptation of the most effective and updated foreign technologies within the next 5 years. Moreover, the ministry is in charge of the definition and the implementation of the national Science Technology

and Innovation policy, which encompasses all the ministry's objective, yet mentioned.

The MoST is structured in 10 separated directorates, each of them covering specific themes related with the NPR such as technology transfer, ICT technologies, indigenous technology development, capacity building and several others. Furthermore, as already mentioned, the ministry hosts the STIC, which features among the 12 TISCs present in Ethiopia. In particular, the center offers access

*The MoST is also active as regards organizing events and debates on very specific and up-to-date topics*

to patent, scientific and technical databases and related usage assistance in the specific fields of agriculture, chemical engineering, civil engineering, electronic engineering and ICT technologies. The center and hence, the ministry itself, also plays an active role in the process of new knowledge creation and promulgation, and it is especially active in the publishing of the so-called "Tech-Science" books/reports. In addition to this, the STIC is also actively involved in the production on

science-related educational video material, which is broadcasted on the national television with the aim of sensitizing and stimulate widespread interest in the field of science and technology among the population.

The MoST is also active as regards organizing events and debates on very specific and up-to-date topics such as the Blockchain, with the aim of diffusing knowledge and foster the understanding of the potential benefits coming from these frontier technologies. Also, the ministry has been the joint sponsor, cooperating with other foreign and international agencies and organizations, of several events and challenges aimed at stimulating and finance innovative projects among Ethiopian engineering students. For instance, MoST is currently promoting an innovation challenge in collaboration with the French-based Association for the Promotion of Science in Africa, aimed at the creation of a feasible and scalable innovative project for sustainable development. The challenge will go on for the whole 2018, it is open to participant from all over Africa and the winning innovative project will be awarded with a temporal financing program.

### **3.1.2. Addis Ababa Institute of Technology – Addis Ababa University**

Addis Ababa Institute of

Technology (AAIT) is the new name for the first institution teaching engineering education in the Ethiopia. Initially named as the Imperial College of Engineering, the university was established in 1953. During the first decade of activity, the institution has constantly enlarged the education offering and, in 1961, the college became part of AAU being known as the Faculty of Technology, then continuing to expand Bachelors' and Masters portfolio. Infrastructures at disposal of

*AAIT Faculty  
has always had  
a leading role in  
creating engineers  
and scientists*

AAIT grew during the years also thank to financial assistance by foreign countries like Sweden and Germany. For the following six decades, the Faculty of Technology of AAU has been educating young engineers and architects. Between 200 and 250 students are admitted each year to the faculty.

Between 2008 and 2009, the Ethiopian government introduced the new educational reform, whereby students admitted to HE are distributed for the 70% to engineering, science and technology- related study fields, and the 30% to social sciences, business, economics,

and humanity faculties. The policy aim is that, in this ratio, the engineering and technology contribution is expected to be on average 40% of the undergraduate student population. With respect to this, the faculty has always had a leading role in creating engineers and scientists needed to speed up technology transfer and innovation, eventually boosting the transformation and fast growth in the Ethiopian economy. Moreover, following the need of effectively manage the large student population and swiftly respond to the needs of the GTP policy in supporting industrial growth and competitiveness, the Faculty of Technology was given autonomy and new leadership with international experience since 2010. Coherently, the faculty was re-organized into AAIT. As of today, the institute is the largest and the most important engineering institute thanks to the high quality of staff that it has been able to attract during the years. AAIT plays a critical role in supporting engineering education in most of the universities across the nation and beyond, training instructors of other universities and delivering courses thought by visiting professors (which is not that common in African universities).

For young PhD holders and researchers returning from their studies abroad, the institute is a very preferred

environment to work in. This is due also to the multicultural and multidisciplinary stimuli coming from the academic partnerships signed over time with universities such as University of Toronto, Michigan State University, Politecnico Di Torino, National Taiwan University of Science and Technology and others institutes from all over the world. Moreover, industrial partnerships aimed at developing and improving local skills are important, too. With respect to this, AAIT has been able to engage in partnership with MNEs like General Electric's renewable energy division in order to transform AAIT in a center of excellence for renewable energy and to serve as a practical learning hub for undergraduate students in the Ethiopian HE system and a research incubator for graduate students. In addition to this, AAIT has recently become a hosting institution of the Oracle Academy with the aim of improving high quality digital and programming skills to young Ethiopian engineers. Finally, the university host one of the TISCs present in the country, offering access to patent and scientific and technical databases, assistance and advice in using databases, assistance and advice on IP management for commercialization, licensing and patent drafting related to new inventions.

### **3.1.3. Industrial Parks Development Corporation**

The Ethiopian IPDC was established in 2014 and is one of the main public enterprise, covering a crucial role for the country's industrial development. Inspired from the full support of government, IPDC has become an engine for industrialization, nurturing the nascent manufacturing industry. The corporation final objective is to

*The corporation final objective is to accelerate the process of industrial transformation of the country*

accelerate the process of industrial transformation of the country, promoting exports and attracting both domestic and foreign investors, ultimately creating employment opportunities. IPDC, in collaboration with the EIC and Ethiopian Revenue and Custom Authority and several other institutions, provides investors opening new activities in industrial parks with one-stop-shop service. This means that IPDC provides any service needed from pre- to post- investment servicing. Parks are fundamental

hubs in which investing firms can leverage on serviced industrial land, pre-built sheds equipped with all the necessary utilities and infrastructural facilities. This is a great achievement since it allows the country to be concretely attractive for MNEs wishing to invest in Ethiopia since they are guaranteed on the compliance with international standards, on workers' security and environmental safety.

The mandate of IPDC and the

*IPDC has supervised the construction and now actively manage several other industrial parks*

proliferation of industrial parks find their basement in the ongoing second GTP (2016–2020) of Ethiopia. This industrial development policy is centered around agricultural-based, manufacturing sector-driven and export-led development. The GTP aims at pursuing the growth of the Ethiopian economy through export-driven industrialization strategy by focusing on: labor- and capital-intensive manufacturing industries, export-oriented and import- substituting industries, contribute to rapid technology

and know-how transfer. In order to achieve this, businesses hosted in industrial parks must relate with industries which have broad linkages with the rest of the economy and, hence, that use agricultural products as inputs (agro-processing). Coherently, the manufacturing industries that have given due attention are: agro-processing ones, such as textile and clothing, food and beverage industries, tannery and leather goods; pharmaceutical and chemical industries, as well as paper and plastic production industries; building materials, glass and related products, metal and engineering, etc. to mention a few.

In addition to the already mentioned Bole Lemi, Kilinto and Hawassa industrial parks, IPDC has supervised the construction and now actively manage several other industrial parks, such as the Addis Industrial Village. It was the first ever industrial park established in Ethiopia, in the 1980's, and it is currently undergoing heavy modernization, including a new management system. The compound includes 10 government-built factory buildings for a total surface of 11,000 m<sup>2</sup> rented to investors, and 9 privately-built factory buildings developed on leased land. Covering 88 hectares of land, it is today at full capacity, offering tailored services and infrastructures to local exporters. Starting from 2016,

IPDC has started the development of several new parks in Mekelle, Dire Dawa, Kombolcha, and Adama. With a final size ranging from 500 to 2,000 hectares, each park will be developed in land-slots ranging between 75 and 200 hectares each one, and will have its own specificities. The rationale behind is that of creating specialized clusters across Ethiopia, so attracting specific foreign investors able to integrate with the existent regional SMEs environment. In particular, Dire Dawa will be shaped on the model of an international Special Economic Zone (SEZ), and it will be easily accessible from Djibouti port thanks to the new railway system, and well connected also with roads and internal flights. Mekelle will leverage on the already established industrial facilities (especially in textiles, leather and pharmaceutical industries), from an active and dynamic regional economic environment and from future railway connections, currently under development. Finally, Adama, the capital of the Oromia region, is already a privileged destination for investors in heavy manufacturing. The future industrial park will leverage on the already existent excellent facilities for foreigners (for instance, high quality hotels) and is already served by an express way to Addis. Also private investors are encouraged to develop industrial

parks, either independently or through Public-Private Partnerships (PPPs) with IPDC. Notable example of this infrastructures are the Eastern Industrial Zone, Huajian Group Shoes Cluster Industrial Park and George Shoes Cluster Industrial Park, to mention a few. Relatively to PPPs, the IPDC is committed to collaborate with private actors during the parks' development stage, since it is the institution on charge of facilitating land and main infrastructure provision.

#### **3.1.4. Ethiopian Economic Association**

The yet cited EEA was established in 1991 as a not-for-profit, non-political professional association after the 1<sup>st</sup> Annual Conference on the Ethiopian economy. During the years, the institute has actively engaged in economic research, training of different duration and focus, organization and promotion of international and national conferences, open discussions and round tables focused on the Ethiopian economy status, development trends and policies. Moreover, the dissemination, through professional journals and various publications, of the results spurring from all these activities and the related research output has been the other major activity of the association. The EEA annually holds general assemblies of members. It is during these meetings that activities and results

of the association are discussed and future plans are approved. The General Assembly is the highest decision-making body and it is in charge of providing the overall policy framework for EEA's members. The Assembly also elects an Executive Committee, which serves for three years, to provide leadership to the institution.

Formally, EEA co-operates with the Ministry of Justice in order to accomplish objectives

*Between 2000  
and 2014,  
the EEA has been  
financed with  
1.8M \$  
by the African  
Capacity Building  
Foundation*

such as: to contribute to the formulation of Ethiopian economic policy leveraging on the association's capabilities and links with the economic and business environment; to promote the professional interest of its members domestically and internationally, since they eventually are the beneficiaries of EEA work, being entrepreneurs and business owners; to promote and foster the study of economics in Ethiopian HEIs and TVETs, since its knowledge and understanding

is of paramount importance for the future development of the country, etc.

Starting from the year 2000, the association has established, under it, a subsidiary body acting as its research division: Ethiopian Economic Policy Research Institute (EEPRI). EEPRI itself is organized in four separate research branches: Macroeconomic division, Poverty and Human Resource division, Industry and Trade division and the Agriculture and Natural Resources division. Each division has its own dedicated staff of researchers as well as its own network of partnerships and collaboration with respect to the particular research output. Some partners are the WB, USAID, Centre for Development Research in Germany, UNFAO, the EU to cite a few. To succeed in its mission, between 2000 and 2014, the EEA has been financed with 1.8M \$ by the African Capacity Building Foundation. This financial support was due to the research and capacity building orientation of EEA/EEPRI. Its results on enhancing rapid economic growth in Ethiopia, on improving human development, democratization and governance as well as improving public sector institutional performance made it possible to receive financial support during all these years.

During the last decade EEA has undertaken many research activities which have been of

great importance for policy improvements. Some of the research activities are initiated by EEA itself while others are defined by sponsoring organizations. For Instance, between 2009 and 2010, EEA has produced about 70 research reports both on independent and demand driven researches. Clients generally are the government, private sector businesses and institutions, and international organization. Moreover, one of the core activities of EEA consist in the organisation of trainings aimed at improving the analytical capabilities of the association's members, policy makers, and the general public. The institution has organized dozens of training programs that benefited several hundreds of people (from both private and public businesses and the government). Among the major training topics there was: the application of econometric software to analyse Ethiopian household data; Ethiopian macroeconomic data structure; impact assessment and performances resulting from development projects, to cite a few. EEA has also been offering internships to students from several HEIs in the country. In addition to this, the institution has been constantly active in organizing public forums and annual conferences in order to facilitate the interaction between policy makers and the general public. For instance, the EEA's 15<sup>th</sup>

Annual Conference was held on 20-22 July, 2017 in Addis Ababa, hosting about 900 of the 4,500 association members and covering topics like "The Future Agriculture in Ethiopia" and several others of great importance for Ethiopian growth.

### **3.1.5. iceAddis incubator/accelerator**

*It is  
a university-based  
innovation hub and  
a co-working  
space for  
communities,  
able to facilitate  
creative projects  
and events'  
organisation*

iceAddis is a business and innovation incubator/accelerator founded in 2011 and located in Addis Ababa in AAU's Lideta Campus. So, it is a university-based innovation hub and a co-working space for communities, able to facilitate creative projects and events' organisation. In fact, the incubator's main target public are students from AAU and especially from AAIT. The final goal of iceAddis is to establish a nation-wide network of collaborations

and to enable young entrepreneurs to develop Ethiopian-made innovations.

iceAddis is in large part financed with funds coming from the GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit - German Organisation for International Cooperation), a state-owned MNE owned by the German Federal Government.

*All along its years of activity, iceAddis has created a community made up of 25 start-ups, 3 ventures and about 6,000 individuals, also organising more than 200 events*

Hence, most of the projects undertaken are commissioned by the German Federal Ministry for Economic Cooperation and Development. The presence of an external commissioning entity also guarantees a certain degree of selectivity in the process of selecting which projects to finance in terms of likelihood of reaching forecasted results. Moreover, in 2013, iceAddis also received funding from Google

for a project meant to foster and grow innovative entrepreneurship in Ethiopia and enable a local network of innovators. As a matter of fact, the incubator's activity has shown its results: iceAddis has established partnerships with other accelerators and incubators not just in Africa, but also in other continent (e.g. The Foundation, AfriLabs, Venture Capital 4 Africa, etc.); it has gathered the attention of medias (e.g. BBC, CCTV, Aljazeera, How We Made It In Africa, etc.); it has featured several local start-ups (e.g. Karta, locally, duka, Addiscan, to mention some) and many projects (e.g. Innovation Slam, Debate, Empower, Impact, etc.). All along its years of activity, iceAddis has created a community made up of 25 start-ups, 3 ventures and about 6,000 individuals, also organising more than 200 events. iceAddis offers a three-tier membership scheme for their members. The first one is the white membership and it mainly functions online, as a digital community. Everyone interested in entrepreneurship can join. In fact, iceAddis's white membership has members from all over the world. Social medias like Facebook and the iceAddis's website newsletter are used to keep in touch, engage and build-up the community. Then, the second tier corresponds to the green membership. It requires to fill in an application form including the applicants' business idea/project, from

which is then made up a business canvas model. iceAddis usually accepts five new green teams each semester (also depending on funds availability). As of 2013, there were approximately 35 green members in 5 teams. The green members' ideas/projects undergo what is called the incubation phase. Hence, they are though with helpful advanced notions, they receive consulting, coaching, help with their business plan in order to facilitate the kick-off phase of their business and the development of their product's prototype. Concerning this, green teams are also provided with access to prototype facilities such as 3D printers and so on. Finally, the red membership generally corresponds to the acceleration phase. The business has already kicked-off, it is in operation and iceAddis start

leveraging on an exit strategy. This means that, generally, once a red team exit, it is required to pay 2% of the business profits to iceAddis. As of 2013, there was 1 team with red membership.

Members are generally asked to pay a fee, depending on their needs and on their membership status. Whereas white membership does not imply any fee, green membership is 800 ETB per semester. However, as the great majority of green teams are made up of students, they usually receive scholarships to cover the fees. Nonetheless, iceAddis facility,

equipment and training offering is opened also to external individuals under different payment scheme for differentiated bundle of offerings.

### 3.2 Challenges, opportunities and learning needs

In order to clearly define and effectively tackle the challenges that the potential spreading of the NPR in Ethiopia implies, as well as to concretely reach and take full advantage of the multitude of possibilities made available by this process of industrial innovation, a crucial preliminary step consists in the clear analysis of the necessary and locally tailored learning needs. Consistently, hereafter it is presented a "Canvas" ideated as a framework to assess and provide clear information on:

1. The local industrial landscape, in terms of **leading industries** for the country's economy and, hence have a high priority as a field of application of the NPR;
2. The set of main **transformation fields/enabling infrastructures**, crucial for the feasibility of the adoption/diffusion of the NPR;
3. The set of actions to be taken at each intersection **leading industry - NPR-enabling transformation**;
4. The actual local **presence of Italian business enterprises**, their willingness to invest/

- engage in new business opportunities in the specific leading industry;
5. The locally defined demand for competencies aimed at the adoption/deployment of the NPR, the deriving **learning needs**, as well as the innovation and policy actions made it necessary to match demand and offering of skills specifically needed on the local job market.

Following the economic data provided in Section 1 (i.e. value added in different manufacturing sectors retrieved from the World Bank Database, import and export data from UN Comtrade Database), the orientation of international investors (e.g. according to the Italian Ministry for Foreign Affairs, the UK Department for International Trade, etc.) and the critical assessment of the authors of this report, the **leading industries** for the Ethiopian economy have been identified following ISIC 2- digits classification and the analysis of the potential benefits from the three key **NPR-enabling transformation** fields has been formulated. Consequently, Canvas 1 is shown in *Table 3.1*.

*Table 3.1* reports an example of Canvas 1: NPR-leading industries have been intersected with the NPR-enabling transformations and the resulting intersections have been analysed in terms of potential benefits. The current formulation of Canvas 1 is a critical re-elaboration of secondary data and grey literature. Hence, it may not be exhaustive. It is meant as a starting point for AIL project participants who will further build upon it, leveraging on their own expertise, first-hand knowledge of the Ethiopian business and innovation environment and knowledge developed during the AIL training program.

The list of Italian investors presented in *Table 3.1* is meant to provide an example of the Italian businesses currently investing/engaged in economic relationships in the afore presented key industries, in Ethiopia. A list, which is needed by AIL project participants to complete Canvas 1 (i.e. *Table 3.1*) is available on the Italian Ministry for Foreign Affairs' webpage (<http://www.infomercatiesteri.it/paesi.php>). Nonetheless, participants are invited to further deepen the research and to provide a critical and insightful assessment of the potential contribution to the NPR coming from these actors.

Finally, for the completion of Canvas 1 (i.e. the qualitative assessment of the feasibility of leapfrogging) and for the subsequent formulation of Canvas 2 (i.e. the concrete definition

of learning needs and existent gaps), AIL project candidates should follow the methodology proposed in the "Learning Needs – Canvas formulation protocol" file.

This assignment has been ideated as a way to make sense of the overall "big picture" encompassing NPR potential, opportunities, challenges and learning needs of local innovators. This is a step necessary to pave the way for the actual diffusion of the NPR in Ethiopia.

<b>Leading Industries</b>	<b>Crop and animal production, hunting and related service activities &amp; Fishing and aquaculture (ISIC codes 01 &amp; 03)</b>	<b>Manufacture of food products (ISIC code 10)</b>	
<b>NPR Enabling transformations</b>			
<b>Energy</b>	Use of renewables and independent mini-grid help to offset outages risk; Energy efficiency allows for enhanced sustainability in agri-food production: Agri- food lifecycle is better-off; ...	Continuity and security of energy supply allow firms to undertake operational improvement and increase productivity; Energy efficiency allows for enhanced sustainability in agri-food production: Agri- food lifecycle is better-off; Improved management of food cold chain; Use of renewables and independent mini-grid help to offset outages risk; ...	
<b>Mobility</b>	Improved road transportation allows to better reach local demand and to take part into international supply chains; Prioritise linkages with established regional airline hub (Addis Ababa) to enhance export opportunities; Improved road transportation allows tackle inefficiencies and wastes in agri-food chain (e.g. perishability issue); ...	Improved road transportation allows to better reach local demand and to take part into international supply chains; Prioritise linkages with established regional airline hub (Addis Ababa) to enhance export opportunities; Improved road transportation allows tackle inefficiencies and wastes in agri-food chain (e.g. perishability issue); ...	
<b>Digitalization</b>	/	Opportunities coming from ICT for handling, storing, transforming (including food safety controls), packaging local agricultural produces; Broadband connectivity as a necessary condition for B2B marketplaces and platforms that disintermediate supply chains and foster access of local producers and transformers to international markets; ...	
<b>Italian Investors</b>	ACOS S.P.A.; GIOVANNI ALFANO FARM; ...	ASFA PLC; ...	

*Table 3.1 - Canvas 1: A few examples of the NPR potential for leading industries and Italian investing firms. Source: the Italian Ministry for Foreign Affairs (<http://www.infomercatiesteri.it/paesi.php>).*

<b>Manufacture of machinery and equipment n.e.c. &amp; Repair and installation of machinery and equipment (ISIC codes 28 &amp; 33)</b>	<b>Manufacture of textiles &amp; Manufacture of leather and related products (ISIC codes 13 &amp; 15)</b>	<b>Construction of buildings &amp; Civil engineering &amp; Specialized construction activities (ISIC codes 41, 42 &amp; 43)</b>
<p>Continuity and security of energy supply allow firms to undertake operational improvement and increase productivity; Use of renewables and independent mini-grid help to offset outages risk; Improved cost-efficiency result in higher international competitiveness; ...</p>	<p>Continuity and security of energy supply allow firms to undertake operational improvement and increase productivity; Use of renewables and independent mini-grid help to offset outages risk; Improved cost-efficiency result in higher international competitiveness; ...</p>	<p>Expand power grid coverage, improve reliability and resilience; Invest in renewables (prioritise geothermal, hydro &amp; solar); Opportunity for exporting energy; Energy stability allows firms for operational improvements and increased productivity; ...</p>
<p>Improvement of paved roads network for peripheral transport enhancement; Prioritise linkages with established regional aviation hub (Addis Ababa) to enhance export opportunities; ...</p>	<p>Prioritise linkages with established regional aviation hub (Addis Ababa) to enhance export opportunities; Improved road transportation allows for better organised and efficient supply chain; ...</p>	<p>Improvement of paved roads network for peripheral transport enhancement; Private- public investment &amp; FDIs opportunities in national logistic system build-up; Prioritisation of railway system development; ...</p>
<p>Improve broadband coverage to industrial &amp; manufacturing areas; Improve speed; Opportunities for operational improvements (e.g. firms adopting updated machineries); opportunities for new business models leveraging on digital platforms; Opportunities for enhanced logistic optimisation (e.g. goods &amp; info flow management); Improved technology absorptive capacity; ...</p>	<p>Opportunities for operational improvements (e.g. firms adopting updated machineries); New automation opportunities (e.g. packaging production stage); Opportunities for enhanced logistic optimisation (e.g. goods &amp; info flow management); Broadband connectivity as a necessary condition for B2B marketplaces and platforms that disintermediate supply chains and foster access of local producers and transformers to international markets; ...</p>	<p>Private-public investment &amp; FDIs opportunities in national digital system build-up; New automation opportunities (e.g. high-tech firms); Opportunities for enhanced logistic optimisation (e.g. goods &amp; info flow management); Improved technology absorptive capacity; ...</p>
<p>AGREX S.P.A.; BARSANTI MACCHINE; Siatex S.r.l.; ...</p>	<p>AFRICAN COTTONS; ETHIO APAREL PLC; GMM GARMENT; ...</p>	<p>BONIFICA S.P.A. ITALIA; ENDECO S.P.A.; Salini Impregilo S.p.A.; ...</p>

*Notes: the table presents an incomplete version of Canvas 1, for the full framework see the “Learning Needs – Canvas formulation protocol” file.*



## Appendix A

*Table A.1* Presents an extended list of possible key actors and related contacts for Ethiopia. Actors have been selected according to their relevance within the NIS, according to an interviewed local

expert. Furthermore, each actor has been classified according to the specific type of institution and ownership (e.g. Government, University, Enterprise, etc./e.g. Private, Public, etc.).

Actor & website	Contact(s)	Type of Institution & Ownership
Ministry of Science and Technology <a href="http://www.most.gov.et/">http://www.most.gov.et/</a>	Email: <a href="mailto:info@MoST.gov.et">info@MoST.gov.et</a>	Government
Addis Ababa Institute of Technology (TISC identified by WIPO) <a href="http://www.aait.edu.et/">http://www.aait.edu.et/</a>	Email: <a href="mailto:eshetie_ethio@yahoo.com">eshetie_ethio@yahoo.com</a> Telephone: (+251) 111232439 Fax: (+251) 111239480	Public University (Gov. financed)
Industrial Parks Development Corporation <a href="http://www.ipdc.gov.et/index.php/en/">http://www.ipdc.gov.et/index.php/en/</a>	Shiferaw Solomon (Deputy CEO Operations and IP Management) Email: <a href="mailto:ipomdceo@ipdc.gov.et">ipomdceo@ipdc.gov.et</a> Telephone: +251-116616986  Amare Asgedom (Deputy CEO IP Development) Email: <a href="mailto:pddceo@ipdc.gov.et">pddceo@ipdc.gov.et</a> Telephone: +251-116616438  Yilma Belachew (Deputy CEO Corporate Services) Email: <a href="mailto:csdceo@ipdc.gov.et">csdceo@ipdc.gov.et</a> Telephone: +251-116616907	Public Enterprise (Gov. financed)
Iceaddis <a href="http://www.iceaddis.com/">http://www.iceaddis.com/</a>	Email: <a href="mailto:contact@iceaddis.com">contact@iceaddis.com</a> Telephone: +251(0) 11 667 4804  Markos Lemma (CEO & co-founder) LinkedIn: <a href="https://www.linkedin.com/in/eweket/">https://www.linkedin.com/in/eweket/</a>  Florian Manderscheid (COO) LinkedIn: <a href="https://www.linkedin.com/in/florian-manderscheid-41498577/">https://www.linkedin.com/in/florian-manderscheid-41498577/</a>  Oliver Petzoldt (co-founder) LinkedIn: <a href="https://www.linkedin.com/in/oliverpetzoldt/">https://www.linkedin.com/in/oliverpetzoldt/</a>	Supporting Institution (Private)

Ethiopian Economic Association <a href="https://www.eaecon.org/">https://www.eaecon.org/</a>	Demirew Getachew (Head, EEA Secretariat) Email Telephone: 251-(0)11-6452415 Fax: 011-6453020  Etsubdink Tesfaye (Executive Secretary) LinkedIn: <a href="https://www.linkedin.com/in/etsubdink-tesfaye-b561896b/">https://www.linkedin.com/in/etsubdink-tesfaye-b561896b/</a> Email Telephone: 251-(0)11-6453329 Fax: 011-6453020  Assefa Admassie (Principal Researcher) LinkedIn: <a href="https://www.linkedin.com/in/assefa-admassie-8147a613/">https://www.linkedin.com/in/assefa-admassie-8147a613/</a> Email	Supporting Institution – NGO (Private)
PRECISE - ESAI <a href="http://preciseethiopia.com/incubator/">http://preciseethiopia.com/incubator/</a>	Henock Assefa (Chief of Party - ESAI Project) Email: zhenok@gmail.com  Amanuel Assefa (Deputy Chief of Party - ESAI project) Email: kidus_aman@yahoo.com  Telephone: +251 92 679 7850 +251 11 663 1080	Supporting Institution (Private)
Ethiopian Chamber of Commerce and Sectoral Associations <a href="http://www.ethiopianchamber.com/">http://www.ethiopianchamber.com/</a>	Email: <a href="mailto:etchamb@ethionet.et">etchamb@ethionet.et</a> Telephone: +251 11 518240 Fax: +251 11 517699	Supporting Institution (Gov. financed).
Ethiopian Development Research Institute <a href="http://www.edri.org.et/">http://www.edri.org.et/</a>	Telephone: +251 (0)115 506 066 Fax: +251 (0)115 505 588 Email	Supporting Institution (Semi-Gov.)
blueMoon <a href="http://www.blumoonethiopia.com/">http://www.blumoonethiopia.com/</a>	Email: <a href="mailto:info@blumoonethiopia.com">info@blumoonethiopia.com</a> Telephone: +251-11-667-4810 Biruk Y. Zenebe (Incubator Coordinator) <a href="https://www.linkedin.com/in/biruk-y-zenebe-34919020/">https://www.linkedin.com/in/biruk-y-zenebe-34919020/</a>	Supporting Institution (Private)
Science and Technology Information Center (TISC identified by WIPO) <a href="http://www.stic.gov.et/">http://www.stic.gov.et/</a>	Email: <a href="mailto:contact@stic-et.org">contact@stic-et.org</a> <a href="mailto:info@stic.gov.et">info@stic.gov.et</a> Telephone: (+251) 114706719 (+251)114706767 Fax: (+251) 114706702	Government
Ethiopian Investment Commission <a href="http://www.investethiopia.gov.et/">http://www.investethiopia.gov.et/</a>	Email: <a href="mailto:info@eic.gov.et">info@eic.gov.et</a> Telephone: (+251) 11 551 0033 Fax: (+251) 11 551 4396	Government
Ministry of Water, Irrigation and Electricity <a href="http://www.mowie.gov.et/">http://www.mowie.gov.et/</a>	Email: <a href="mailto:mowieethiopia@yahoo.com">mowieethiopia@yahoo.com</a> Telephone: +251 11 661 1111	Government

Ministry of Communication and Information Technology <a href="http://www.mcit.gov.et/">http://www.mcit.gov.et/</a>	Email: <a href="mailto:mcit@mcit.gov.et">mcit@mcit.gov.et</a> Telephone: +251 11 550 3973	Government
Ethio ICTVillage <a href="http://www.mcit.gov.et/web/guest/ict-village">http://www.mcit.gov.et/web/guest/ict-village</a>	Telephone: +251 11 551 9138	Government
Policy Study and Research Institute <a href="http://www.psrc.gov.et/web/en">http://www.psrc.gov.et/web/en</a>	Email: <a href="mailto:psrcinfo@psrc.gov.et">psrcinfo@psrc.gov.et</a> Telephone: (+251) 0116610462 Fax: (+251) 0116621821	Government
Climate Innovation Center <a href="http://www.ethiopiatic.org/">http://www.ethiopiatic.org/</a>	Email: <a href="mailto:info@ethiopiatic.org">info@ethiopiatic.org</a> Telephone: +251(0)9 29 13 15 48 +251 115 58 12 67	Supporting Institution – NGO (Private)
Entrepreneurship Development Centre <a href="https://www.edcethiopia.org/index.php">https://www.edcethiopia.org/index.php</a>	Email: <a href="mailto:info@edcethiopia.org">info@edcethiopia.org</a> Telephone: +251-115-571-164	Supporting Institution (Semi-Gov.)
Ministry of Transport <a href="http://www.motr.gov.et/">http://www.motr.gov.et/</a>	Email: <a href="mailto:motr@motr.gov.et">motr@motr.gov.et</a> Telephone: +251 11 551 6166	Government
Hub Innovative Society <a href="http://www.xhubaddis.com/contact">http://www.xhubaddis.com/contact</a>	Email: <a href="mailto:info@xhubaddis.com">info@xhubaddis.com</a> Telephone: +251 11 8603298  Line Petros (representative) <a href="https://www.linkedin.com/in/line-petros-905a1a117/">https://www.linkedin.com/in/line-petros-905a1a117/</a>  Leul Dereje (representative) <a href="https://www.linkedin.com/in/leul-dereje-518679a8/">https://www.linkedin.com/in/leul-dereje-518679a8/</a>	Supporting Institution (Private)
Agricultural Transformation Agency (ATA) <a href="http://www.ata.gov.et/contact/">http://www.ata.gov.et/contact/</a>	Email: <a href="mailto:info@ata.gov.et">info@ata.gov.et</a> Telephone: +251-115-570-678 Fax: +251-115-570-668  Nuredin Mohammed Kemal (Director, ATA Regional branch office. Hawassa) LinkedIn: <a href="https://www.linkedin.com/in/nuredin-mohammed-kemal-09313340/">https://www.linkedin.com/in/nuredin-mohammed-kemal-09313340/</a>	Supporting Institution (Gov. financed)
Enterprising Ethiopia <a href="http://www.enterprisingethiopia.com/home.html">http://www.enterprisingethiopia.com/home.html</a>	Stephen Whaley (Programme Director - UK & Addis) LinkedIn: <a href="https://www.linkedin.com/in/swhaley/">https://www.linkedin.com/in/swhaley/</a> Email: <a href="mailto:spwhaley@gmail.com">spwhaley@gmail.com</a> Telephone UK: +447976235317 Telephone Ethiopia: +251(0)922786019  Carlo Tortora Brayda di Belvedere Email: <a href="mailto:carlo.tortora@gorillaict.com">carlo.tortora@gorillaict.com</a>	Supporting Institution – NGO (Private)

Table A.1 – Extended list of possible key actors and contacts.

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