ETHIOPIAN TRANSPORT MASTER PLAN

2022 - 2052

Summary Report

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MINISTRY OF TRANSPORT AND LOGISTICS

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Foreword

Transportation is a major driving force behind the growing world. The role of sustainable transport systems along with universally accessible, quality and resilient infrastructure in building strong economic foundations for all countries is well recognized in the UN Sustainable Development Goals. Agenda 2063 of the African Union also aspires an integrated continent through world class infrastructure and quality transport services across Africa.

Ethiopia, one of the fast growing economies in Africa in the past decades, has envisioned being an African Beacon of Prosperity by 2030. One of the strategic focus areas of the Ethiopian National Development Plan is thus the expansion of quality and accessible transport infrastructure as well as the realization of efficient, safe and reliable services.

Our Ministry, in line with the global overarching sustainable development goals, the continental agenda, and the national vision; has developed the sector policies and strategies. Moreover, based on the international planning framework and the national policies; a 10-years perspective plan of the transport sector was developed and put to implementation; and at present the development of a 30-Years Integrated Transport Master Plan is completed with the coordination of the our Ministry and the active engagement of all stakeholders.

The 30 Years Integrated Transport Master Plan document caters a long-term planning perspective and an integrated approach including other related sub-sectors. It provides technical review of the previous accomplishments in the sector, identifies the gaps, and recommends what should be done for the coming decades by predicting and analyzing the future scenario with core emphasis for integrated development with other economic sectors.

The Master Plan will bring an opportunity for all actors engaged in the sector: government bodies, private sector (contractors, consultants, and service providers), development partners, academia, and the public to get first-hand information on the future trend of the Ethiopia's transport sector and use it as an input for their strategic planning.

The implementation of the Master Plan will be facilitated by our Ministry with active engagement of the private sector. The private sector will obviously be the primary actor in translating the plans into action by deploying the majority of human, financial, material and intellectual resources; and the role of the Ministry is mainly on furnishing favourable regulatory environment and a fair play ground.

As the world continues to grow, develop and change; the transport and logistics sector is in a continuous dynamism. Hence, the Master Plan will be continuously reviewed and updated to accommodate emerging developments.
It is my strong belief that the transport and logistics sector will significantly influence the economic development of Ethiopia favorably for the coming three decades. The Integrated Transport Master Plan will thus be a fundamental guidebook and language of communication with stakeholders and partners for our future endeavors in the sector.

I would like to emphasize that coupled with integrated planning and implementation; our concerted efforts will allow us to put a founding stone for the prosperity of Ethiopia.

Dagmawit Moges
Minister of Transport and Logistics of the Federal Democratic Republic of Ethiopia

ETMP50

WHAT ETMP IS AIMED FOR

The ETMP50 is aimed to contribute for building Ethiopia with a resilient and diversified middle-income economy, driven by the private sector; eradicating extreme poverty and hunger; building human capabilities; creating a modern policy and institutional framework; and creating an efficient, resilient and well-functioning financial market. This National Transport Master Plan is then based on the definition of different integrated and inter-modal actions and measures, following defined **tasks,** such as:

1. Producing a **transport system that can stimulate international exchanges and economic development in any part of the country;**

2. Making the **transport offer responsive to the real passenger and freight demand** in terms of capacity, performance and safety & security;

3. **Integrate the different modes of transport** for an efficient, effective and reliable transport;

4. **Increasing the rural accessibility,** environmental sustainability and social inclusion in rural areas;

5. **Integrate land use/transport planning,** where the transport system has to respond appropriately to the needs of present and proposed land use developments, population growth, economic and social welfare in the country.

6. Introduce **sustainable ways of infrastructure capital and maintenance financing;**

7. Creating a transport system supported by **update and appropriate technologies**

ETMP CONSTRUCTION FRAMEWORK

According with the national planning documents, like the Homegrown Economic Reform Programme, Ten-Years perspective plan, UN 2030 Agenda and regional integration programmes, the following main representative National Development Objectives, are considered:

1. SOCIO-ECONOMIC DEVELOPMENT of the population, through poverty reduction, social services, job opportunities.

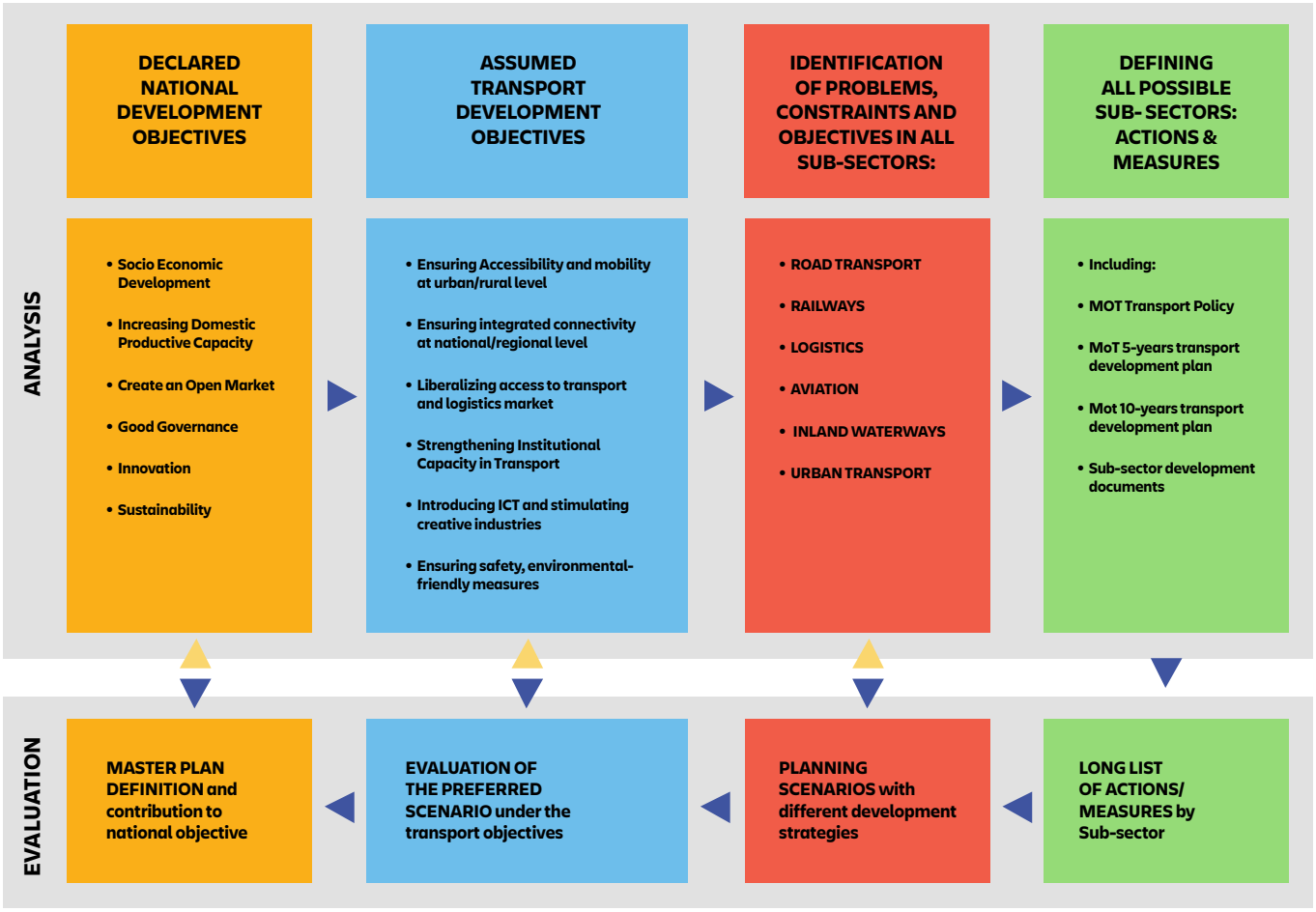
2. INCREASING DOMESTIC PRODUCTIVE CAPACITY, increasing productivity in the most promising economic sectors, like agriculture, manufacturing, mining, tourism.

3. CREATE AN OPEN MARKET, in order to facilitate internal trade, import/export and facilitating foreign investments in the country;

4. GOOD GOVERNANCE, creating an effective administration system with clear and straightforward regulations.

5. TECHNOLOGY INNOVATION, considering all the new advanced possibilities in ICT applications;

6. SUSTAINABILITY, safeguarding the environment and climate change adaptation measures



ETMP50 TRANSPORT DEVELOPMENT STRATEGIES

The **ETMP 2050 Strategies,** according with national objectives are:

- **SOCIO-ECONOMIC DEVELOPMENT - Ensuring accessibility and mobility at rural/urban level,** creating rural accessibility to basic services, creating sustainable urban public transport and ensure good inter-urban services.
- **INCREASING DOMESTIC PRODUCTIVE CAPACITY - Ensuring integrated connectivity at national and regional level,** enlarging the road, railway, airports, logistic chain and introducing inland water services in appropriate locations.
- **CREATE AN OPEN MARKET - Liberalizing access to transport and logistic market,** facilitate custom transport procedures and create the appropriate environment for domestic and international private investments.
- **GOOD GOVERNANCE - Increase effectiveness of transport administration** and its capabilities in planning, design, construction and maintenance of transport investment, ICT use and innovation in all mode of transport.
- **INNOVATION - Take advantage of the last transport technology and use of ICT.** Considering different modes of transport, like cable car, river/lake transport, pipeline, etc. and all the new advanced possibilities in ICT transport applications and smart city applications in transport.

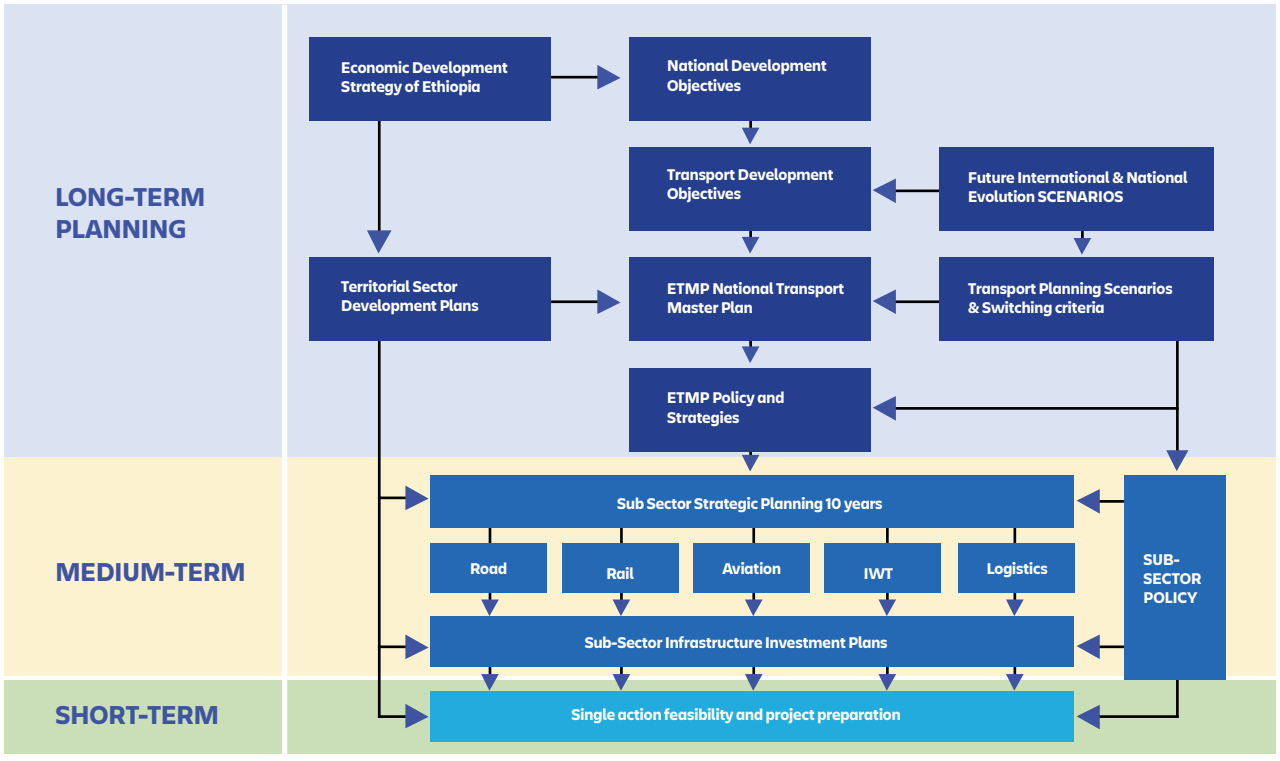
- **SUSTAINABILITY - Ensure safety, environmental respect and apply measures to adapt to climate change.** The transport sector should apply all the measures that are known for transport safety, environmental respect: use of renewable energy, reducing gas emissions, infrastructure design for adapt to climate change.

TRANSPORT PLANNING FRAMEWORK

The Ethiopia Transport Master Plan constitutes a dynamic national long term transport plan that will guide transport planning, management and operations for all the different modes and spheres of government, developing intermodal/multimodal transport network and integration with urban/rural & economic development of the country. The ETMP also serves for enhancing the capacity of Ministry of Transport and Logistics other concerned agencies/institutions on the various transport planning tools and techniques, especially those employing new technology, through training activities and workshops.

The Transport Master Plan here presented is a **Dynamic Integrated Master Plan,** based on **three development scenarios,** according with three possible economic development trends, influenced by the overall international situation: **going-ahead, new-generation and limits-to-growth scenarios.** The three scenarios are not alternative each other but are the appropriate response to different external international economy evolutions and an **optimal path** can be suggested following appropriate switching values for the change from one scenario to the other. The ETMP50 should be revised each five years.

The scope of the Ethiopia Transport Master Plan is to create the framework for development of each mode of transport (road, rail, aviation, logistics, inland water and urban mobility) for the next 30 years. The following figure represents the overall planning framework, from the long-term national multimodal transport plan to the subsector medium term infrastructure plan and the specific short-term project preparation procedures, before implementation of the single major infrastructure investment.



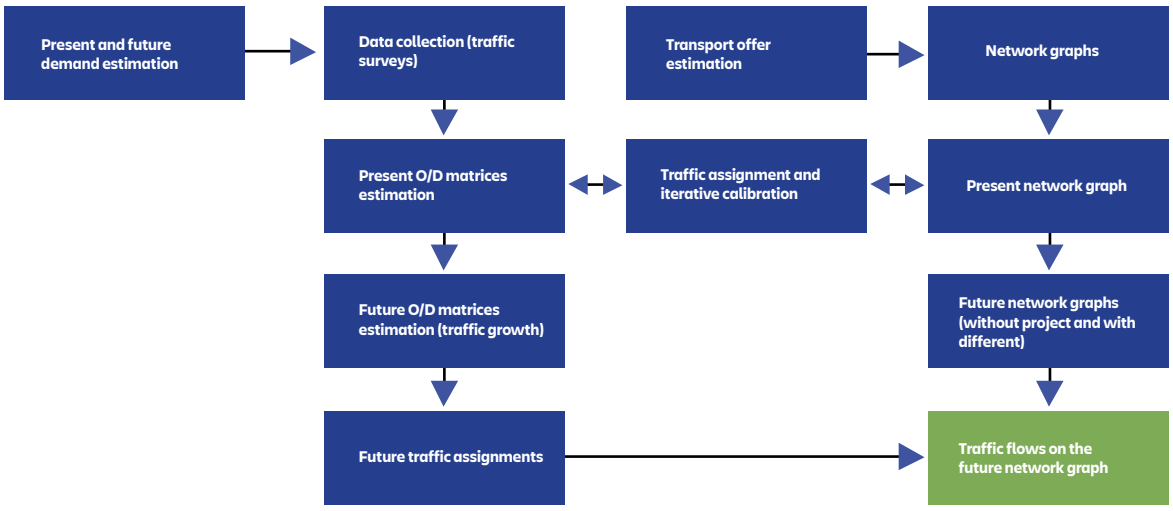
BUILDING THE ETMP-50 TRANSPORT MODEL

THE INTERMODAL TRANSPORT MODEL AS A TOOL FOR DECISION-MAKING ASSESSMENT

The Ethiopia Master Plan is based on the construction of a Multimodal Transport Model that reproduces the present situation and gaps, projects future situations and identifies interventions that can integrate future transport demand-offer. The first steps taken was to develop a simulation model of Ethiopia's intermodal transport network (road, rail, aviation, logistics), initially calibrated to the current situation and later developed for the simulation of all future scenarios up to the year 2050. The goal was to simulate the multimodal and regional/national transport system at the present and in the future, under different assumptions on the offer side (infrastructure configurations, projects, etc.) and on the transport demand side (territorial population, income, development projects, etc.). The model has been developed using a well-established approach and a proven software, i.e. TransCAD, developed by Caliper Corporation.

The most part of the modelled network is represented by the road network (about 50,000 km), given the prevalence of the road network over other modes of transport in terms of geographical extension and coverage. The connections between the road network and the other modes of transport were made with virtual links with an associated transfer cost. The simulation was extended to the railway network and to the connections with external ports. A specific sub-model was also developed for the aviation sector, including all domestic passenger destinations and for trade transport (logistics).

Basically, the model operates with a confrontation between offer and demand. The offer is represented by the intermodal transport network with its characteristics (length of each section, travel tine, costs, etc.) and the demand by origin/destination matrices (O/D matrices) where each cell represent the transport demand (in passengers per day or tons per day) between pair of transport attraction zones (TAZs). After a preliminary calibration of the O/D matrix and after the projection of the existing demand to future scenarios (in our case such projection was based on demographic and GDP aspects) the future demand is “assigned” to the future transport networks for any potential analyzed scenario. The next figure shows the flow chart diagram of the entire procedure.



TRAFFIC COUNTS AND ORIGIN/DESTINATION SURVEYS

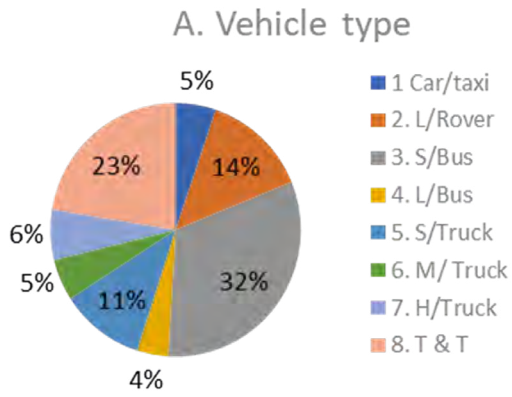
The model was initially developed on the basis of traffic data provided by ERA and other entities managing the transport infrastructure in Ethiopia. However, when the conditions were right for this to be done (January and February 2021), a campaign of traffic counts and origin/destination surveys was also carried out in order to:

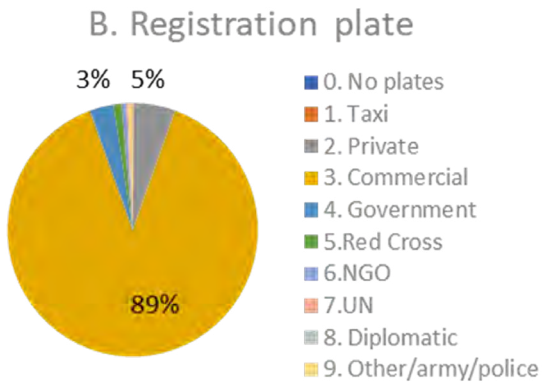
- Check for possible discrepancies between the traffic counts provided by ERA and used in the model and the current traffic flows, considering the exceptional nature of the current period, especially as regards the effects of the Covid 19 pandemic
- Collect samples of O/D pairs that can be used for recalibration or validation of the model used for the generation and attraction of traffic and the construction of the origin/destination matrices.

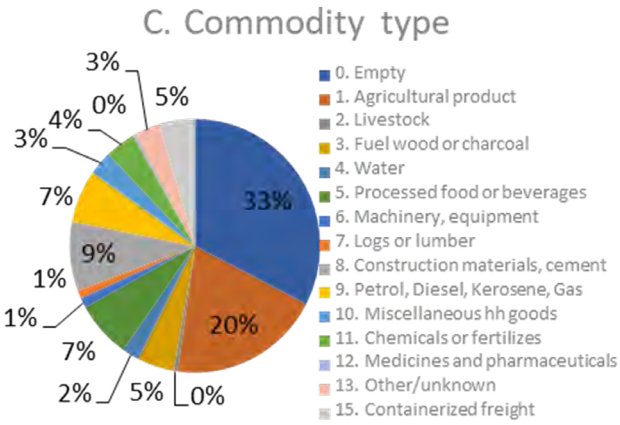
The counts were then carried out during the day on a sample of 15 sections, in parallel with the origin / destination surveys.

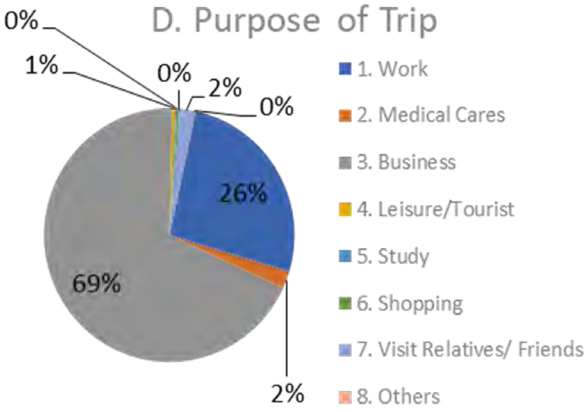
A remarkable number (just under 45,000) of origin/destination interviews was collected of which 55% to drivers of passenger vehicles and 45% to drivers of freight vehicles.

The investigation was not only limited to the origins and destinations of the journey, but also to the collection for statistical purposes of other information, such as the type of vehicle, the amount of people or goods transported, the type of goods, the purpose for the journey, etc.







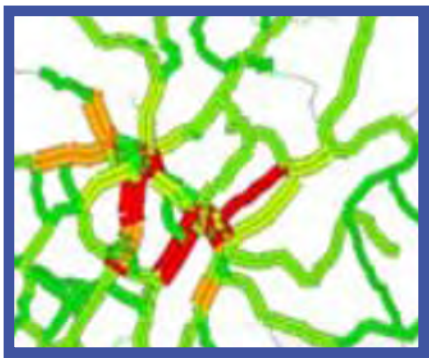


PRESENT TRANSPORT SYSTEM SIMULATION AND CONGESTIONS

The Transcad runs following the calibration simulation were performed using a complex approach, based on a two-stage traffic assignment: (1) in the first phase, the freight component was assigned using the average kilometric rate cost as a basic cost factor for road and rail, as well as the real or apparent costs of handling at sea terminals or road/rail and (2) in the second phase the passenger component is assigned in terms of equivalent vehicles, using the pre-assigned freight component as preload to better define the level of network congestion. In both cases, equilibrium algorithms were used.

The present levels of services were estimated using the relationship between flow and capacity. The concept of "service level", in fact, is generally specific to the road transport mode. In order to simplify, the following congestion levels were considered:

The figure below gives a representation of the existing levels of service. It must be highlighted how at the moment capacity problems are present around urban areas (Addis Ababa and partially Dire Dawa). It should also be noted that the model tends, due to the combined effect of the traffic data used, the zoning adopted and the calibration method, to "expand" congestion on the sections entering/exiting the cities. The figure presents the levels of service with a chromatic scale. Links with colours from green until orange are under capacity level, while links in red are links that may become critical at the corresponding time horizon



According with the Model assignments at present (year 2020):

- High level of congestions appears at Addis urban section, Alemgena – Tiya, Modjo – Ziway, Adama – Metehara, Adama – Dera;
- Moderate congestions in Holeta – Muger, Holeta – Ambo, Tiya – Butajira, Dera – Asela, DireDawa – Cinile and Harar – Babile.

VISION 2050

An integrated thirty years Plan for the transport and logistics sector is a challenge that requires a Vision of the future Ethiopian Economy and Society enough robust and consistent to allow the basic choices in investments and policies. This Vision is articulated in the different domains of the human development.

a) Demography. According to the most recent FAO projections, the Ethiopian population will reach in 2050 the level of 188 million individuals. This growth, at an average pace of 2,2% per year will create tensions on the natural resorces, particularly water and arable land, already challenged by the global heating phenomenon. A furter challenge will be the education and the creation of job opportunities for the new generations.

b) Food security. The agricultural and livestock sector will answer to the food security challenge with an accelerated policy of productivity increase, based on mechanization, irrigation and use of fertilizers. The shift toward an intensive agricolture and livestock will reduce the gap of the arable land and at the same time will change substantially the agro-pastoral social condition, contributing to the poverty fighting effort. The rural road development will grant accessibility to the basic services for the rural communities.

c) Urban development. The acceleration of the urban development will happen in a less centralized way. The second level towns will grow faster than the capital City and the development corridors will concentrate the new initiatives. A new urban transport planning and management of these towns will allow an increased quality of life and job creation.

d) Economic growth and job creation. The economic development will be based on the point of strength of the Ethiopian economy and will allow a steady growth, particularly in the second and third decade. Digitalization and knowledge based industries, supported by massive capacity building programs, will be the core basis of the development.

e) Manufacturing industry. The opportunities coming from the AfCTA launch will be kept by the manufacturing industry, that will see the intra-Africa export to grow remarkably. The Foreign Direct Investments will find profitable conditions to stabilize and develop. The international corridors implementation will support the export flows and will make Industrial Parks and Dry Ports the basis of this development.

f) Ports Diversification. The development of new Ports, particularly Berbera and Assab, as an alternative to the ones in Djibouti will reduce the land-locked Country logistic gap and will favour the economic integration and the good relationships with the neighbouring countries. At the same time, Ethiopia will develop the transit traffic, particularly for South Sudan, contributing to the repayment of land infrastructures investments.

g) Air transport and air navigation. The continental leadership acquired in the international air transport by EAG will lead to its international expansion, also through acquisitions and will drive also the internationalization of the Ethiopian air navigation services. The national aviation market will be developed with the support of the national airport network improvement, in a regulatory framework oriented to the liberalization of the services and to the entry of new operators.

h) Construction industry. The construction industry, in the two components for the public infrastructures and for the private market, will continue to grow in quantity and quality, reaching quality levels and unit dimensions that will allow their international expansion. This industry, after years of capacity building and dedicated quotes, will become a net contributor to the knowledge base and to the new technologies. This growth will allow a development of the up-stream sectors, particularly cement and construction materials mining and manufacturing.

i) Energy surplus. The hydroelectric development policy will have brought its results in terms of an energy surplus. This surplus will become a degree of freedom to be used to develop new energy-intensive industries, as the one of the production of green hydrogen, or alternatively to export the energy to ease the FX needs.

j) Private investors environment. In coherence with the Homegrown Economic Reform, it will be created a conducive environment for the private investors and operators, based on a level play field with the public operator, liberalization to the access for new ventures, an enabling public administration and banking conditions with currency rules favourable for foreign investors. The role of the privates will become prominent in almost all sectors, not only in the form of Capital Investments and Foreign Direct Investments, but also trough the development of the PPP schemes, able to lighten the burden on the public budget.

k) Professional and civic growth. The entrepreneurial associations and the professional orders will develop and will enhance their role of the interests protection and of counterpart of the public policies definition. At the same time the Trade Unions will develop the protection of the working conditions and of the salary levels. More in general, the participation to associations and movements by the population will determine a growth of the civic engagement and the citizenship rights awareness.

l) Gender equality and human rights. The policies for gender equality, particularly for the access to instruction and to job opportunities will be successful and on the long term will widen the productive base of the Nation, with new generations better educated and ready to the modernity challenges, but also oriented to the protection and expansion of the human rights.

m) Mid-income Country reach. Reaching the status of lower-mid-income country is a target that will be reached within the year 2025, when the per capita income (according to the base scenario assumed into the study) will reach the level of 1.088,4 USD, that is over the lower limit of the lower-mid-income country according to the latest World Bank definition. In the year 2050 the per capita income, at the present values will have reached the level of 2.563 USD, that positions the Country at the middle of the interval of the lower mid income status (from 1.086 to 4.225 USD).

n) New challenges. The reached targets of personal income will unite new consumer behaviours and new personal needs. The pressure for services, particularly health-care and transport, of sufficient quality will be high and the desire to own a private transport mean will make the automotive demand boom. The booming demand will be also for the freight vehicles, according to the projected freight volumes demand. The growing pressure of these trends on the commercial trade balance will make the situation sustainable just in presence of the creation of a national automotive industry, enough robust to operate in logic of «import substitution» .

NATIONAL ECONOMIC SCENARIOS

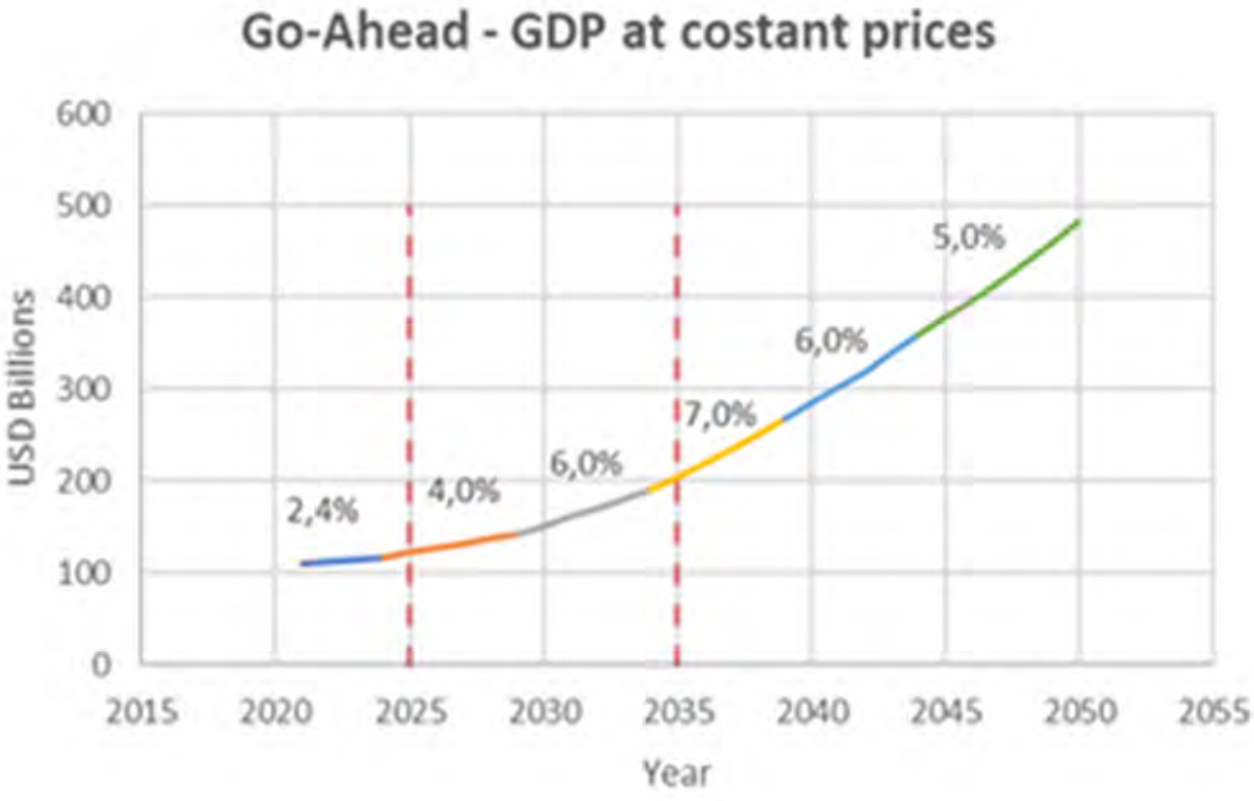
WHY A PLURALITY OF DEVELOPMENT SCENARIOS

- Global warming acceleration, Covid Outbreak and worser international political relationships consequences constitute Uncertainties of un-precedent magnitude.
- These Uncertainties bring high risks of obsolescence of the Master Plan, in the case that the future economic trends, drawn for a thirty years period, would resolve to be non-confirmed by the actual data recorded in the next years of plan.
- In order to obtain a “transport master plan resilience”, it is necessary to create a “multi-frame” scenario set and a number of policies and plans coherent with the specific scenario.

After the scenario definition, it is also necessary to identify the key uncertainties that could bring the decision, from the Governing Authorities, to switch from one scenario to another

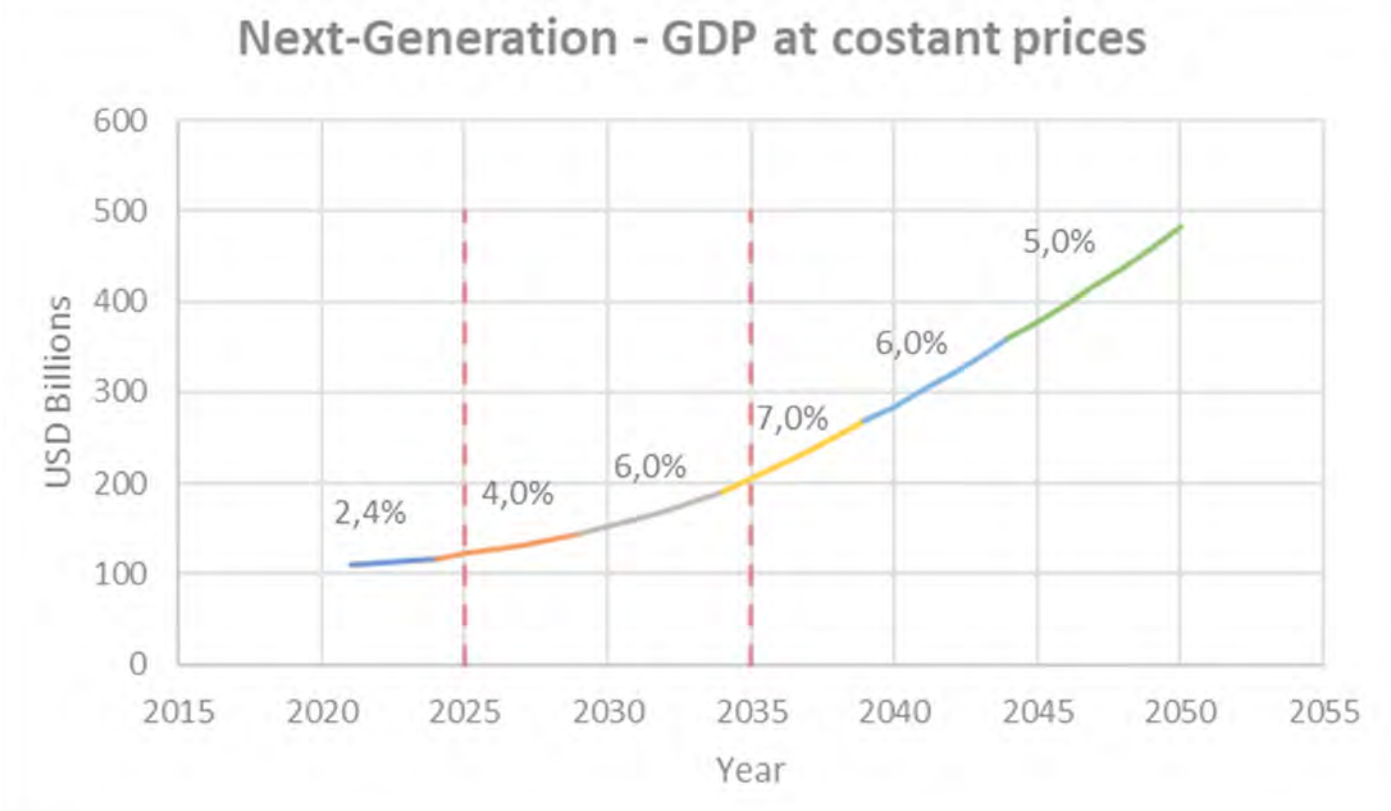
SCENARIO 1 «GO-AHEAD»

- Characterized by the continuity with the policies and the planning expressed by the Government of Ethiopia in recent times
- Smooth recovery from pandemic of the most developed countries, that recuperate the pre-Covid levels in two-three years, also thanks to a strong injection of public-funded investments in the economies
- In this frame the "Homegrown Economic Reform Plan" of Ethiopia keeps its objectives, even though with some years of delay. Ethiopia is able to leverage on its points of strength and becomes a preferred destination of the Foreign direct investments, with significant injection of know-how and new technologies.
- This scenario can, in principle, fully incorporate the "Ten years Perspective Plan" of the transport sector: Railway reform, International corridors, Road network completion.



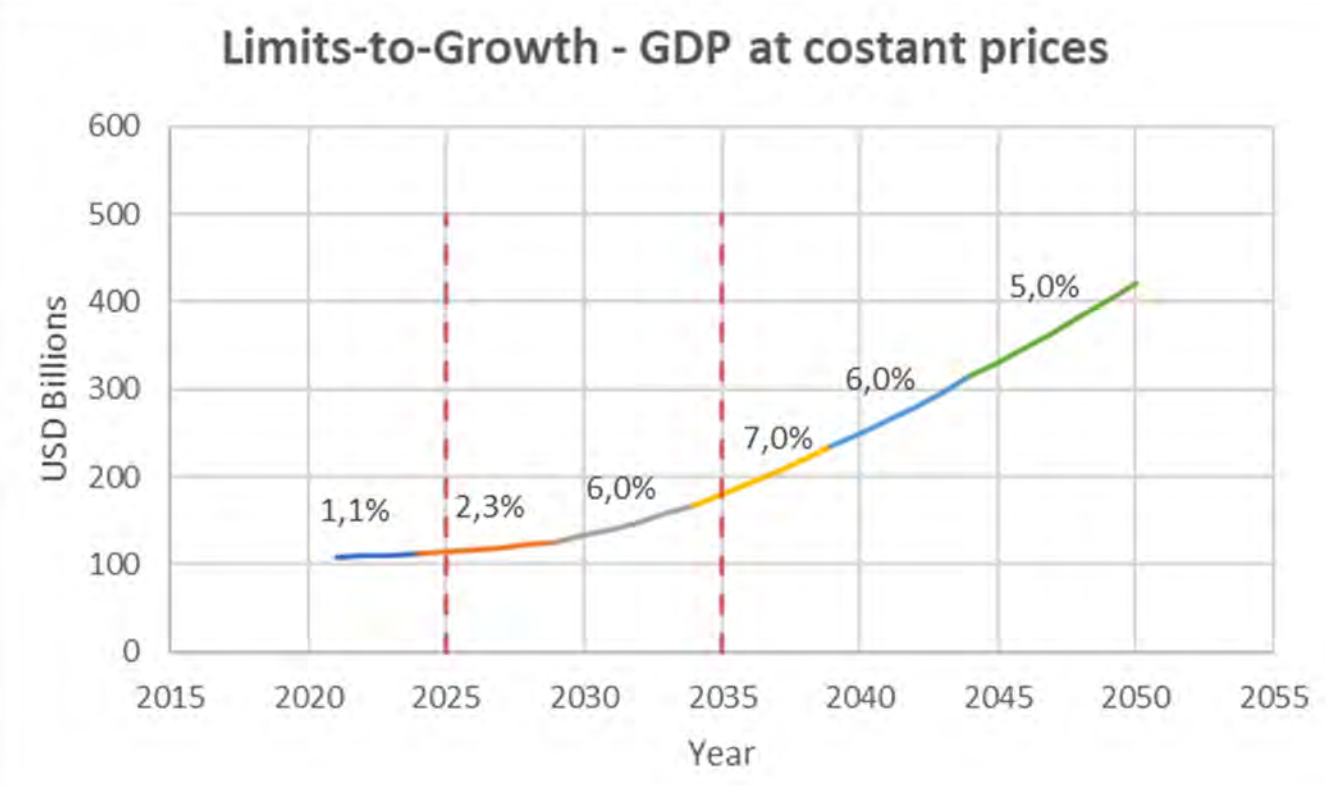
SCENARIO 2 «NEXT GENERATION»

- Same macro-economic conditions of Scenario 1
- The guiding idea under this scenario is that the technologies and the energy sources used in motorizing the transport means have shown in the last months an astonishing acceleration, thanks to the political actions in response of the global warming, and the major economies will invest unprecedented amounts of money in the re-conversion of their transport systems in order to reduce emissions
- which technologies will dominate the next phase It seems at this point clearer : electric and hybrid engines for the small and medium road vehicles and Hydrogen fuel cell engines for the heavy trucks and for the sea vessels.
- The alternative road of zero emission with electric and fuel cell engines reduces the risk of the start-up of new railways lines and better capitalize the recent and future investments in roads.
- In these conditions, the investment plan will be much more focused on the road infrastructures, that become more efficient and far more environmentally friend. The railways investment is reduced and focused on the strategic lines, like the ones for the main international corridors.



SCENARIO 3 «LIMITS TO GROWTH»

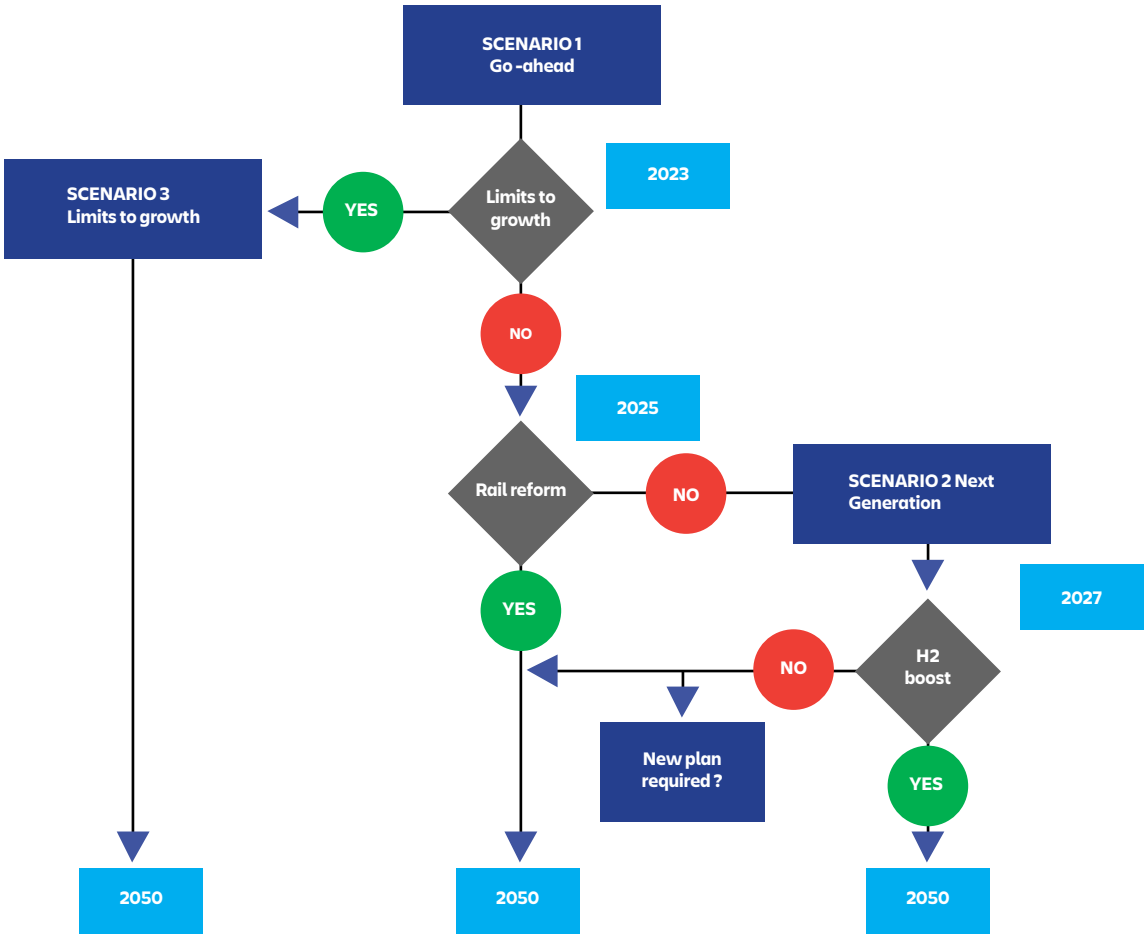
- This scenario could materialize if the economic effect of the pandemic and of the war in Europe will be much worse than the ones assumed in Scenarios 1 and 2. In this sense this is a CONTINGENCY Scenario
- For what concerns Ethiopia, the "Homegrown Economic Reform Plan" that continued to be vulnerable to external shocks, would see these vulnerabilities materialize.
- Rising protectionism and weaker-than-expected global growth would negatively affect exports further exacerbating FX and debt vulnerabilities.
- the PPP attractiveness for international investors would be much reduced, and at the same time the public-owned transport and infrastructure Companies would have limited resources to be invested, in a general situation of shortage of FX.
- The new investment projects would be limited to the ones that can really make a strong difference. A stronger investment activity can be borne in the second decade and third decade, when the conditions for a new growth phase will have been restored.



THREE KEY UNCERTAINTIES

- **Will economic growth recover, and Homegrown economic reform plan can be respected?**
- **Will Ethiopian railway reform be successful, and its commercial performance accelerates?**
- **Is the "energy transition" and the electric and Hydrogen technologic shift materializing at competitive costs?**

A possible path for the Scenario switching



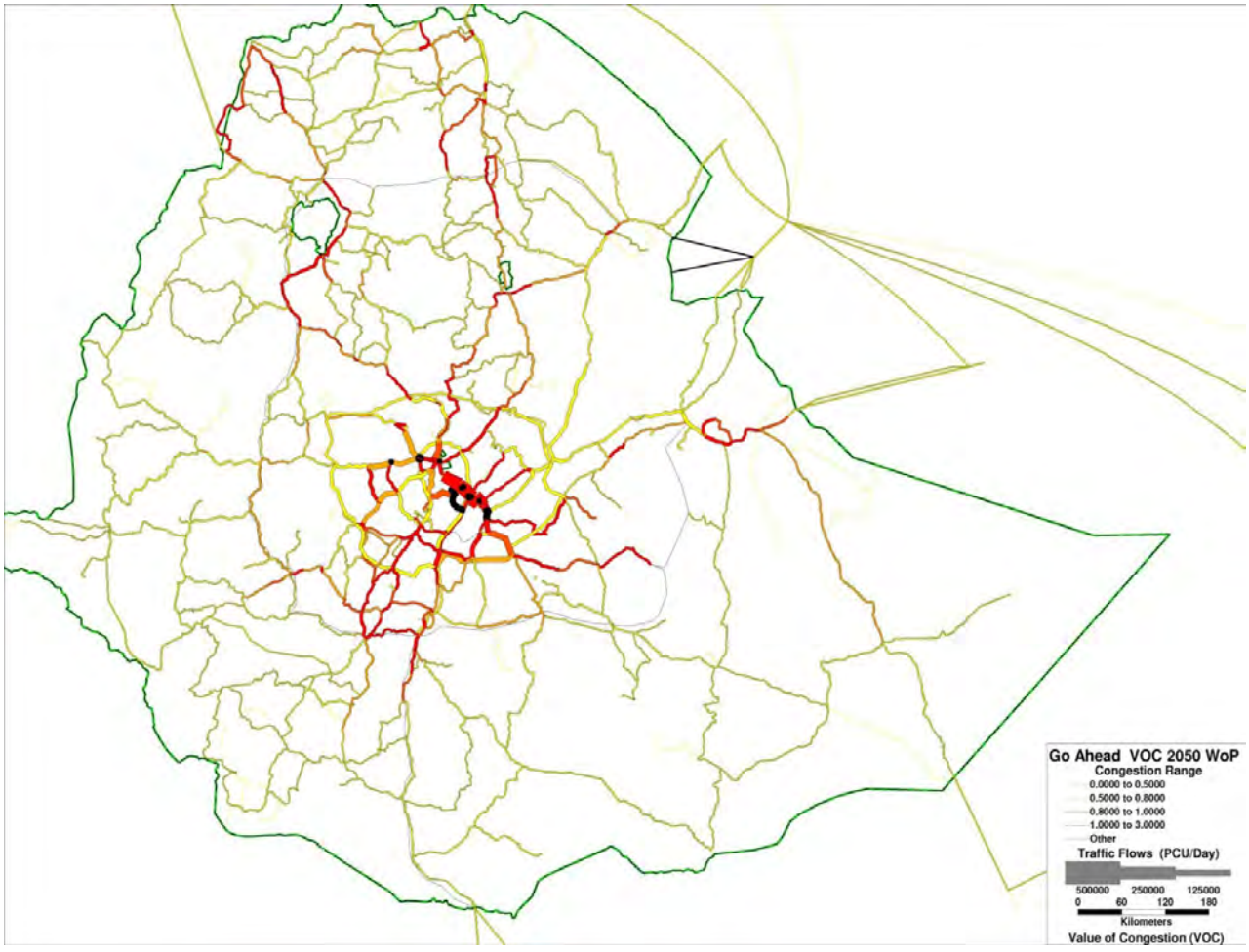
TRANSPORT DEMAND KEY DRIVERS

FACTORS INFLUENCING FUTURE TRANSPORT DEMAND

In order to build the Future Transport Model at different horizons (2025, 2035 and 2050), different socio-economic and territorial development foreseen in the short and medium-long term have been considered, increasing or decreasing the average traffic demand growth calculated in the preceding paragraph. A specific traffic demand growth factor has been calculated for each traffic attraction zone, in accordance with its foreseen territorial development, building new future Origin/Destination matrices for freight, passengers and vehicles at the different time horizons considered.

The scenarios were also modified in terms of infrastructure offer, based on the assumptions gradually developed during the development of the Master Plan. This allowed for a supply/demand comparison for all the scenarios analysed from time to time, also being able to assess the impacts in a "what-if" logic. The figure presented below as an example and shows the impacts of the 2050 demand ("Go Ahead" scenario) on a road network without intervention. The links depicted in red/black are the critical links, where specific enhancement interventions have been identified. The model was therefore a fundamental tool for verifying the choices made during the development of the Master Plan.

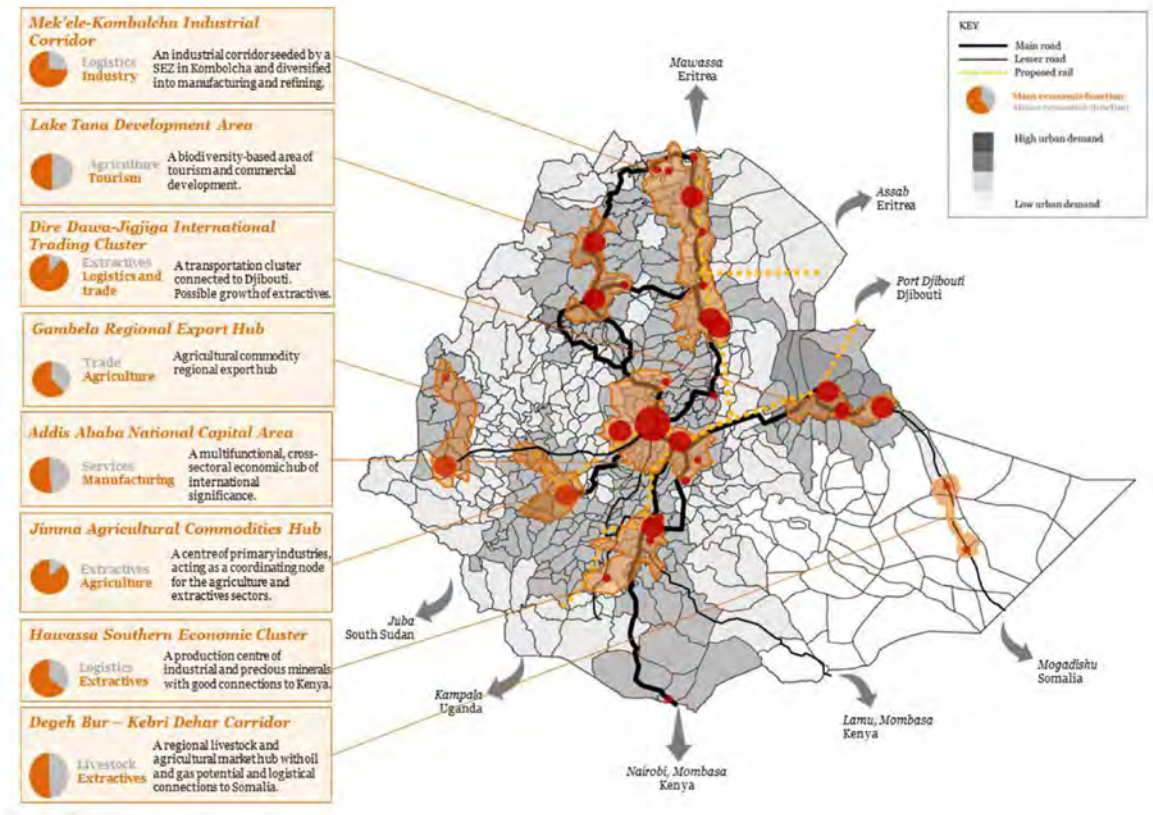
Factors considered were: Development corridor & Urbanization, Industry & Agro-industry, Crop surplus production, Agro-centers, Mines, tourist sites and international trade.



DEVELOPMENT GROWTH CORRIDORS

Spatial planning activities in Ethiopia are concentrated in corridor development planning, along the main regional connection, giving attention to the different economic comparative advantages and the need for regional integration. The implementation of the development corridors will substantially increase the transport demand of goods and passengers, through:

- **Unlocking the potential of secondary urban growth centres** by harnessing the economic efficiencies offered by enlarged 'second cities' that can diversify and accelerate growth. To ensure a future balanced growth, the Government needs to invest in a network of cities distributed across regions that will improve links with international and regional markets. This will diversify the economic activity and distribute wealth across the country.
- **Agglomerating and connecting economic functions.** Clustering economic activity brings additional value to economic activity: the location of these clusters should help to strengthen the value chain (raw materials, manufacturing, supply chains and trade).
- **Targeting the development of a compact, connected and resilient urban network.** As outlined in the work of the Global Commission on the Economy and Climate, a well-managed urban growth based on dense, mixed-use urban neighbourhoods can improve economic efficiency and climate and environmental performance and can enhance resilience, all at a low cost. The same principle applies to the national urban plan and highlights the value of key supporting infrastructure in delivering Ethiopia's Climate Resilient Green Economy

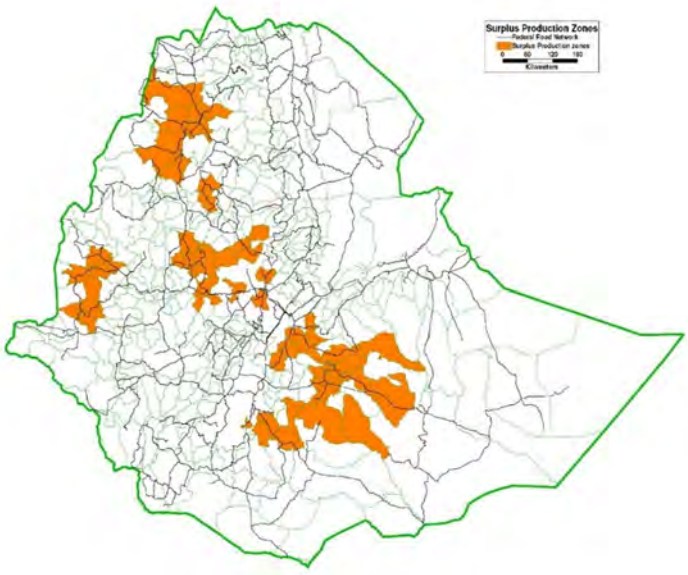


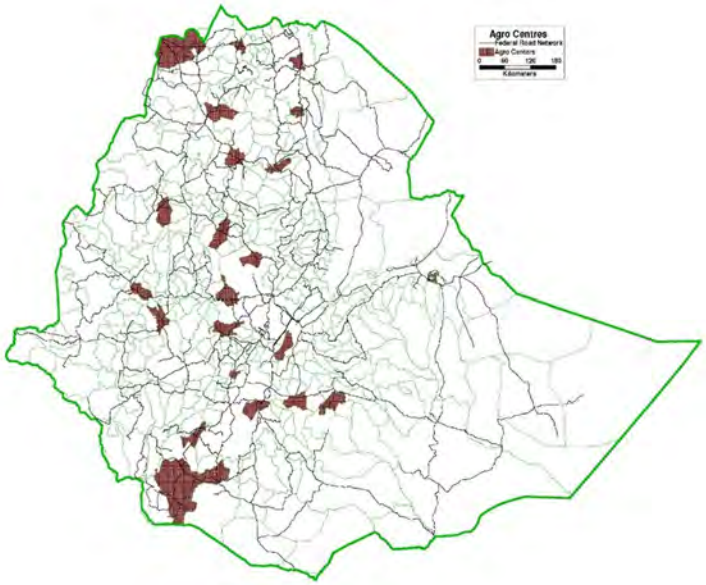
FARMS & AGRO CENTERS

The Ten-Years Perspective Plan (2021 – 2030) puts emphasis on the need of reducing the reliance on rain-fed agriculture, developing irrigation capacity; expanding agricultural mechanization for smallholder farmers; improving animal husbandry; expanding horticulture development; expanding the participation of private investors in agriculture and rendering agriculture more resilient to climate change by reducing the impacts of environmental and climatological changes affecting it.

To accomplish the mentioned objectives of agricultural development, the Perspective Plan fixes the following quantitative targets for the coming ten years (2020/21-2029/30):

- To increase the total annual quantity of crop production in all production systems from 543 million quintals to 925 million quintals;
- To increase horticulture production from 181 million quintals to 261 million quintals;
- To increase the quantity, variety, and productivity of livestock and fisheries;
- To reduce annual soil pollution from its current level of 20.5 tons CO2eq per hectare to 15.84 tons
- To increase the annual biomass quantity from 27 to 75.2 million metric tons;
- To enhance the reduction of greenhouse gas emissions from 36.84 million, metric tons to 125.8 million metric tons

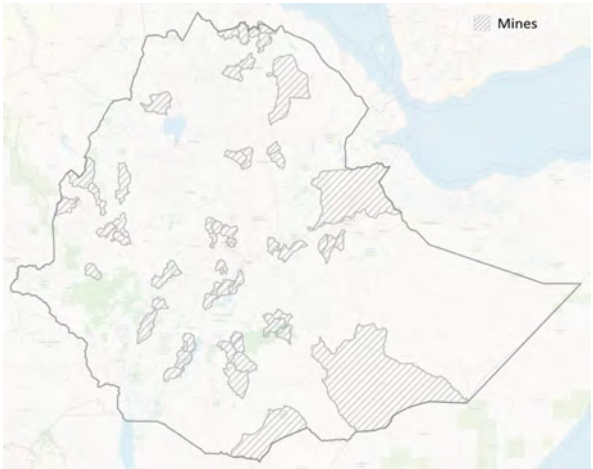




INDUSTRIAL PARKS & MINES

To accomplish the objectives of industrial development, the Perspective Plan fixes ambitious quantitative targets for the coming ten years (2020/21-2029/30). The key strategic direction is the creation of **industrial parks** with small and medium scale industrial development; and large-scale industries with special emphasis all geared to poverty alienation & development. The manufacturing industries that have given due attention are agro-processing industries, textile and clothing, food and beverage industries, tannery and leather goods, pharmaceutical industries, chemicals and chemical products industries, paper and paper products, plastic industries, building materials, glass & glass products, metal & metal engineering etc. to mention a few. The industrial development strategy aims at making Ethiopia a leading manufacturing hub in Africa by 2025, achieving an annual growth rate of GDP 11%, Manufacturing 25% and Exports 30%.

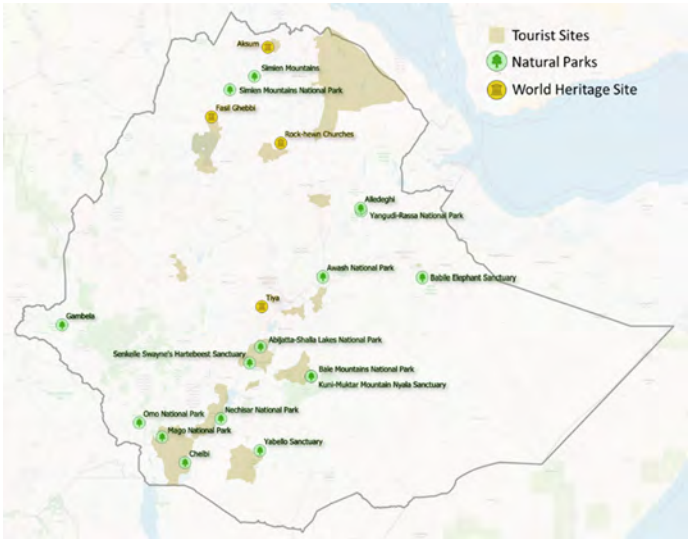
Ethiopia mineral potential endowement: **Gold** Large ore-based gold mines are the Lega Dembi (the largest mine in the Sidamo province of southern Ethiopia and Sakaro, which have been mined by private companies; **Tantalum** is mined at the Kenticha Tantalite mining. This mine also produces quartz, feldspar, kaolin and dolomite used in industries **Gas fields** are located in the southeastern part of the country at Calub, Hilala and Genale gas fields in the Ogaden Basin. The gas resources potential of these fields has been assessed as 4.6 Trillion Cubic Feet (TCF) Precambrian to Recent period rock formations are found suitable for use in construction and in industrial use. **Potash** has gained some of the greatest interest.95% of the world's potash is mined for use in fertilizers, while the rest is used for feed supplements and industrial production. The Danakil Depression is calling out for exploration. Danakil lies at the junction of three tectonic plates, and was formed as a result of the African and Asian continents moving apart. This caused rifting and volcanic activity, resulting in its complex and alluring geology. **Phosphate.** There is a very high demand for phosphate in Ethiopia, due to its importance as a fertilizer. Importing fertilizers is prohibitively expensive and therefore extensive exploration has been conducted in recent times in Bikilal in the west and Melka Arba in southern Ethiopia. Good prospects have been made for **Sapphires, Emeralds, Opals,** and also for **Graphite, Lithium, Petroleum, Oil Shale, Coal deposits, Bentonite, Diatomite and Gypsum**



TOURIST SITES AND NATURAL PARKS

Apart from the two main tourism routes in Ethiopia: **Northern Historic Route of monuments** (Lalibela, Aksum, Gondar, Lake Tana monasteries and the source of the Blue Nile) and the **Southern Route,** including cultural and natural attractions of the lower Omo Valley, National Parks, Rift Valley Lakes (Langano, Hawassa and Chamo.), specific areas that offer potential to increase the number of visitors is the following:

- MICE Tourism in Addis Ababa (Meetings, Incentives, Conferences, and Exhibitions)
- Cultural Heritage Based Tourism Products, like Harar, Gondar, Lower Awash Valley, where the skeleton of Lucy was found, source of Nile in Bahir Dar, Origin of coffee routes in the southwest
- Trekking in - Simien Mountains, Bale Mountains, Mount Yossef;
- Rock Climbing in Gheralta in Tigray and the Bale Mountains in the Southeast.
- Water-Based Activities - The Blue Nile, Omo and Baro Rivers are important for white water rafting with their own diverse tourism activities.



The boat service between Bahir Dar and Gondar along Lake Tana that is currently used as a public transport by the local communities could be included to enhance and differentiate some tourism circuits;

- Thermal Tourism, like the great potential for Wellness and Spas tourism in "Filwahas" or the different hot springs in Addis Ababa; Sodere, Wondogent, Yrgalem, Alaba, Kemise and Fentale
- Bird Watching - Top bird watching areas, for instance, Lake Tana, the Rift Valley Lakes (Abijatta-Shalla, Chamo Hawassa, Chamo, Ababya, Chewbahir) the lower Omo Delta, Goba-Yabello and Bale, Nechisar and Mago National Parks are some of the Important Bird Areas (IBA) in the country that are visited by many birdwatchers;
- Running in Ethiopia. Distance running has produced many champions in Ethiopia;
- Community Based Tourism - There are numerous communities based eco-tourism initiatives and associations flourishing all across the country;
- Great Adventure Desert Expeditions, like the Danakil Depression and Erta Ale volcano in the Afar region.

INCREASE OF TRANSPORT DEMAND

Besides the general transport demand factors In the next 30 years, like demography, income, economic activity, transport options, geography and land-use, specific additional mobility generation/ attraction factors have been considered for each woreda, like:

- Urban population and density areas
- Industrial parks & logistics
- Agricultural surplus productions and agro-centers
- Mining sites
- Tourist sites
- Trade centers

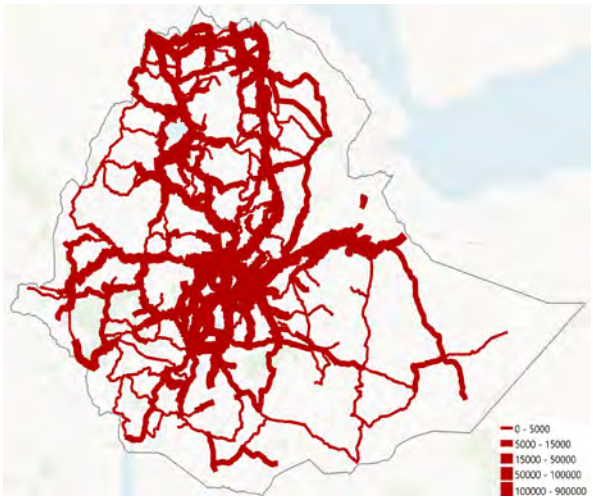
Giving a surplus in terms of capacity to generate/ attract transport denand.

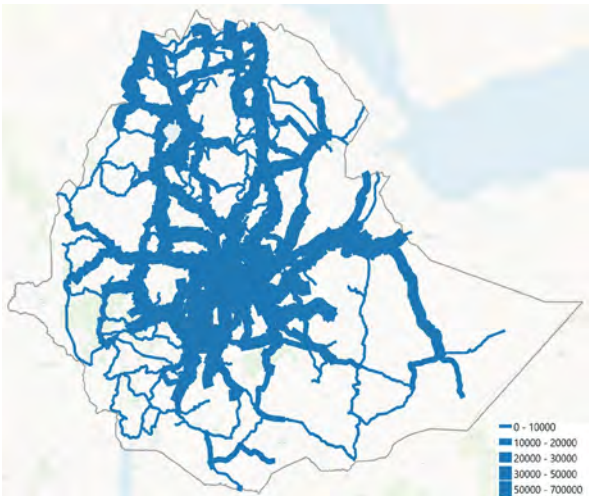
Period	GDP Year Over Year (%)	η Freight	Freight Transport demand Year over Year (%)	η Passenger	Passengers Transport demand Year over Year (%)
2020-2024	2.4	1.12	2.69	1.09	2.62
2025 - 2029	4	1.12	4.48	1.09	4.36
2030-2034	6	1.12	6.72	1.09	6.54
2035 2039	7	1.12	7.84	1.09	7.63
2040-2044	6	1.12	6.72	1.09	6.54
2045 - 2049	5	1.12	5.6	1.09	5.45

Incremental Growth Factors	Passengers			Freight
	Surplus factor	Numb. of zones	Delta factor	Numb. of zones
Base Zones	negative	87	negative	87
Corridor Development	positive	159	positive	159
Urbanization	positive	52	positive	52
Industrial & Agro-Industr.	positive	15	positive	15
Crop Surplus Production	positive	58	positive	58
Agro Centres	positive	22	positive	22
Mines	positive	54	positive	54
Tourist Site	positive	26	nul	26
Internat. Trade	nul	14	positive	14

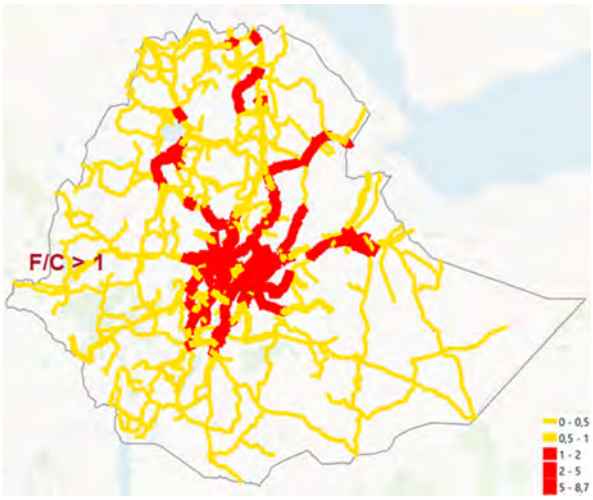
2050 TRANSPORT DEMAND Growth

Projecting transport demand factors for each couple of Origin Destination in the 30 years of the ETMP50, passengers and tons are assigned on the available transport network, obtaining the following daily flow diagrams for passengers and tons.





In terms of vehicles (light & heavy) the traffic demand at year 2050 is estimated to reach very high values of congestion (up to 4 or 5 times the capacity offered) if adequate number of lanes are not offered. This situation regards the area surrounding the capital and the main star direction from the capital to the Ethiopia borders. The below figure shows the massive congestion that could be created at year 2050 and the congestion after implementation of expressways and railways identified by the ETMP50:



MOBILITY AT YEAR 2050

NEW APPROACH OF HGER AND MAIN GAPS IN TRANSPORT SECTOR

The main challenges for the Ethiopian transport sector are those related to the ability of the sector to serve the future demand of mobility in a sustainable way. The main gaps to be filled can be classified as:

- physical gaps, what is missing to connect in physical way different locations in the country: infrastructures, terminals, means of transport;
- policy gaps, what is missing in terms of governance, organization, legal framework and knowledge of the institutions in charge of leading the transport sector.

PHYSICAL GAPS

The transport capacity of the country (infrastructures, terminals, means of transport) has grown a lot in the past decades and has been concentrated along the lines of greatest demand for mobility. With the growth of demand in the coming decades, this capacity will be largely insufficient to support the development of the country.

Without substantial improvements in the current endowment of infrastructures and terminals, as well as vehicles for transporting goods and people, the transport system will be characterized by widespread congestion phenomena and its insufficient performance will negatively affect the economic activity and the quality of life of citizens. There is a strong need to fill these gaps, adapting the physical endowment of infrastructures and means of transport in all sub-sectors: from ports to roads, from dry ports to railways, from buses to airports.

Filling these gaps does not means just 'adding' new infrastructure to the old ones. The growing level of demand will require transport capacity to be organized as an integrated network of infrastructures, vehicles and terminals.

The investments necessary to achieve this objective will have to be planned coherently with the evolution of mobility needs, in order to build the transport capacity requested by the society.

POLICY GAPS

Until now the role of private operators in Ethiopia has been ancillary to public action. The financial effort required to deal with the challenge of future mobility needs is too large to be left entirely on the country's public budget. But financial criticality is not the only reason to collect private efforts, foreign and domestic. The future growth of Ethiopia will require a different way to manage the transport sector, giving space to private entrepreneurship in order to allow the public sector to gradually focus on planning and regulation.

Transport sector is not only the logistics arm of the Ethiopian development but also an opportunity to satisfy the growth of the domestic demand. Though Ethiopia's manufacturing development has been leaded by a strategy of industrialization based on an import-substitution approach, the industries of infrastructure machinery/vehicles and automotive appears unable to act as a real alternative supply channel. These industries have to be considered as high priority manufacturing sectors, in order to limit the strong impact of currency needs on the country's balance of payments.

Moreover, the opportunity to develop the transport industry should also be related to the continental positioning of Ethiopia in view of the progressive continental integration, supporting the path of a growing role of the country as a producer for Africa.

This path is the third gap to consider: Ethiopia should have a strong international projection due to its nature and ambition in the African continent. The country is already the African leader in the aviation sector, but ports diversification is a process to be carefully undertaken, while non tariff barriers in land transport will have to be harmonised within the African trade integration process.

To address the challenges of future mobility the transport sector must have the capabilities to understand them and provide solutions. However, the success of establishing a central administrative level is currently hampered by large gaps at the level of regional states or local administrations. The successes achieved at the center in the leadership and management capacity of public bodies are far from being achieved at the local level: there is a risk of a serious divide between the two levels of governance, Federal and local, in the ability to implement general or sectoral objectives. Moreover, as future mobility calls for a different role of privates, new competencies are requested to the institution in charge to lead the transport sector: more planning / economic knowledge are key levers of the future public officials.

HGER AND TRANSPORT STRATEGIC GOALS

In order to cope with both international and domestic challenges, the latter coming from the robust development path, Ethiopia has to intervene on the side effects of its rapid growth of the last decades. This is the aim of the Homegrown Economic Reform (HGER), which is strongly focused on the enhancement of productivity and competitiveness of the overall economy.

The main objective of the HGER is to valorize the huge public investments of the past decades by mobilizing both capital and managerial knowledge of private operators, thus encouraging the public enterprises to undertake a path to economic efficiency.

A gradual transition from public to private sector-led growth is the leading concept of the strategy for the Ethiopian transport sector. The strategic goals to enable the Ethiopian transport sector to meet the challenges of the coming decades are as follows:

- Provide a higher level of services, both in quantity and quality terms ensuring the sustainability of the sector.
- Adopt a model of public intervention in the sector consistent with the Home Grown Economic Reform.
- Improve technical and managerial capabilities of the sector, both for institutions and private companies.
- Exploit the industrial side of the sector by capturing the development opportunities of the internal mobility market.
- Prepare the sector for the implementation of the Free Trade Agreement.

INSTITUTIONAL REORGANISATION

To adapt sectoral public institutions to the new challenges means to design and fine-tune the rules of engagement making possible a stable and conducive participation of private companies in the economic life of the country.

This means to fill the gaps of the sectoral regulatory frameworks by introducing the third-party principles to regulate safety issues and economic relationships and, more widely, to move towards a more competition-oriented environment. In the long term the focus must shift from direct provision of services to the creation of suitable conditions for a coexistence of both private and public operators, acting on a level playing field.

Present model

Future model

NEW TRANSPORT RESPECTING ENVIRONMENTAL AND CLIMATE CHANGE

The measures proposed by the ETMP50 incorporate the effort that Ethiopia has been carrying out for years in terms of mitigating climate change. It is now increasingly evident that the effort against climate change is a priority that every country must deal with. It goes without saying that the transport sector has an important responsibility as it contributes between 20 and 25% of total global emissions. It is therefore necessary that the change of perspective starts from the transport sector, incorporating the global demands towards a drastic reduction of emissions and the use of the most modern sustainable technologies. In the latest years, Ethiopia implemented a comprehensive set of climate change mitigation policies and strategies that already cover all relevant sectors including transport.

In particular, the ETMP50 takes into account the indications and guidelines contained in the various official documents that testify the commitment of Ethiopia in the global effort to mitigate the adverse effects of climate change. Those documents are the following.

- The Ethiopia's Climate Resilient Green Economy (CRGE) Strategy which called for an emission reduction in transportation, through different countermeasures, such as: improving and extending Ethiopian public transport and its electric rail network, including outside Addis Ababa, raising efficiency standards as well as applying them to a larger share of vehicles in Ethiopia, and further expanding the use of alternative fuels and propulsion systems. Additional measures ranged from avoiding traffic with an urban planning transition focusing, inter alia, on transit-oriented development and improving rural and urban transport infrastructure both for non-motorised and motorised transport to fiscal instruments.
- The Climate Resilient Transport Sector Strategy, which sets the framework to deliver an integrated, modern transport system with a strong focus on multi modal transportation links. The vision of this Strategy is to ensure that Ethiopia's national development, poverty reduction and climate resilience goals are promoted by the transport sector through: an improved public transport accessibility and safety; a reduced greenhouse gas emissions from the transport system and network; a reduced exposure to pollution and an increased non-motorized transport mode use in urban areas.
- The National Adaptation Plan (NAP-ETH), which calls for building a sustainable transport system. The Plan urges for adequate transport system that will facilitate the movement of aid and support to climate change-affected communities.
- The MoT 10 years Development Plan, which call for establishing a Climate-resilient transport infrastructure and services, and set three objectives: (1) making 20% of the national road infrastructure climate-resilient; (2) reducing aviation fuel consumption with the aim to reduce GHG emission of the whole sector and (3) increasing climate smart mass transport vehicles.

Transport Master Plan – Go Ahead

Total interventions in the 2022 – 2052 period:

Federal roads network: 4,101 km of improved capacity. 5,714 km of pavement upgrading, 10,557 km of missing link construction and 392 km of city bypasses.

Expressways: 5,049 km of new expressways and 1,321 km of national connecting ring roads

Regional Roads: 22 thousand km of new regional roads- 60 thousand km of rehabilitated roads and 90 thousand km/day of regional public transport services

Railways: 8.700 km long railway network

Airports: 10 new or expanded airports - 11 existing airports enhanced – 150/190 new aicrafts to be purchased

Logistics: Implementation of the Trident and construction of at least 8 additional dry ports

Inland Water Transport: realization of 9 "full port" characterized by Commercial Port Area, Fishing area, shipbuilding and Passenger Area

Urban Mobility: Adoption of a SUMP (Sustainable Urban Mobility Plan) for all cities with > 50,000 inhabitants

Intercity Public Transport: Adoption of a Corridor Mobility Agency and establishing of intercity public bus connections

GO AHEAD Advantages of the application of the proposed road investments:

In terms of time (x h): a total of 191,901 daily hours are saved by the PCUs, while 146,685 hours are saved by passengers and 522,015 hours for the tons transported.

In terms of distance (x km): a total of 7,037,329. km is daily saved by PCUs, while 5,119,270 kms are saved by passengers and18,161,457km by freight that increase of about 7,338,3127km are carried by the railway system.

In terms transport cost (VOC) the assignment calculates a daily savings of 6,872,444 USD for light and heavy vehicles and a total cost savings (value of time) of time spent equal to 5,433,670 USD. The total Road User Cost Savings in a day is then 12,306,114 USD.

Transport Master Plan - Next generation

Total interventions in the 2022 – 2052 period:

Federal roads network: 4,101 km of improved capacity. 5,714 km of pavement upgrading, 10,557 km of missing link construction and 392 km of city bypasses.

Expressways: 5,049 km of new expressways and 1,321 km of national connecting ring roads

Regional Roads: 22 thousand km of new regional roads- 60 thousand km of rehabilitated roads and 90 thousand km/day of regional public transport services

Railways: 7.360 km long railway network

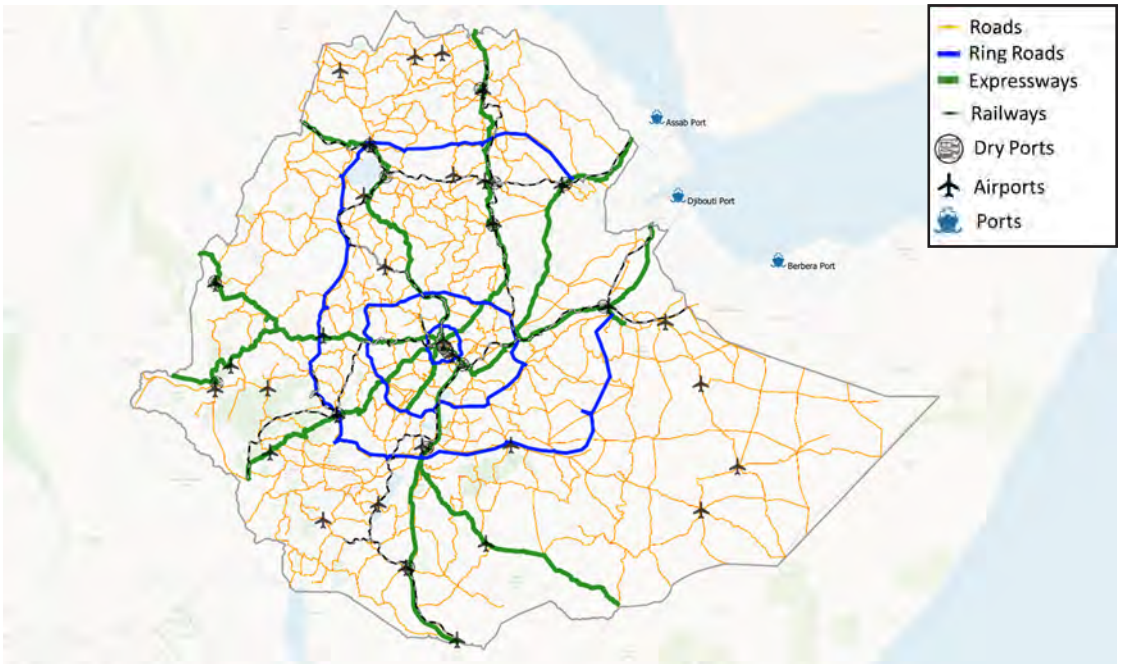
Airports: 10 new or expanded airports - 11 existing airports enhanced – 150/190 new aicraftsaircrafts to be purchased

Logistics: Implementation of the Trident and construction of at least 8 additional dry ports

Inland Water Transport: realization of 9 "full port" characterized by Commercial Port Area, Fishing area, shipbuilding and Passenger Area

Urban Mobility: Adoption of a SUMP (Sustainable Urban Mobility Plan) for all cities with > 50,000 inhabitants

Intercity Public Transport: Adoption of a Corridor Mobility Agency and establishing of intercity public bus connections



NEXT GENERATION Advantages of the application of the proposed road investments:

In terms of time (x h): a total of 646,346 daily hours are saved by the PCUs, while 1,383,862 hours are saved by passengers and 1,399,345 hours for the tons transported.

In terms of distance (x km): a total of 14,707,538km is daily increased by PCUs, while 53,954,153 kms are saved by passengers. The freight transport along the railway system are saved 18,136,750 km, while are increased 88,639,760 Km by road network, for an overall increase of 70,503,010 Km.

In terms transport cost (VOC) the assignment calculates a daily savings of 14,094,268 USD for light and heavy vehicles and a total cost savings (value of time) of time spent equal to 14,858,746 USD. The total Road User Cost Savings in a day is then 28,953,015 USD.

Transport Master Plan - Limits to growth

Total interventions in the 2022 – 2052 period:

Federal roads network: 4,100 km of improved capacity. 5,714 km of pavement upgrading, 10,557 km of missing link construction and 392 km of city bypasses.

Expressways: 5,049 km of new expressways and 1,321 km of national connecting ring roads

Regional Roads: 22 thousand km of new regional roads- 60 thousand km of rehabilitated roads and 90 thousand km/day of regional public transport services

Railways: 3.350 km long railway network

Airports: 10 new or expanded airports - 11 existing airports enhanced – 150/190 new aicrafts to be purchased

Logistics: implementation of the Trident and construction of at least 8 additional dry ports

Inland Water Transport: realization of 9 "full port" characterized by Commercial Port Area, Fishing area, shipbuilding and Passenger Area

Urban Mobility: Adoption of a SUMP (Sustainable Urban Mobility Plan) for all cities with > 50,000 inhabitants

Intercity Public Transport: Adoption of a Corridor Mobility Agency and establishing of intercity public bus connections

LIMITS TO GROWTH Advantages of the application of the proposed road investments:

In terms of time (x h): a total of 6,717,445 daily hours are saved by the PCUs, while 8,135,331 hours are saved by passengers and 17,137,796 hours for the tons transported.

In terms of distance (x km): a total of 10,047,868 km is daily increased by PCUs, while 59,378,823 kms are saved by passengers. Along the railway system are increased 4,084,003 km for the freight.

In terms transport cost (VOC) the assignment calculates a daily savings of 14,580,164 USD for light and heavy vehicles and a total cost savings (value of time) of time spent equal to 14,280,493 USD. The total Road User Cost Savings in a day is then 28,860,657 USD.

TRANSPORT SUB SECTORS INVESTMENTS

FEDERAL ROADS: INCREASING CAPACITY, CONDITION & NETWORK

Increasing capacity - The parameter used to evaluate the service level of the road links in the different scenarios was the **congestion factor** (Fc). This parameter, according to international procedure, is calculated by dividing the Average Hourly Traffic by the effective capacity of each road links. Moreover, the average hourly traffic is obtained dividing the daily traffic volume (taken as the bidirectional assigned traffic), by 16. This represents the hourly traffic volume to be compared with the effective capacity of the links, estimated based on International Capacity Manual. Annexes 1, 2 and 3 report the list of more than 1,850 road links traffic flow and capacity factors in each scenario considered (Go Ahead, Next generation, Limits to Growth) and the 3-time horizons considered (2025, 2035, 2050). The ETMP model assignment for each time horizon, identified the links with insufficient capacity (missing-capacity links) that need alignment and cross-section improvement (number of lanes, shoulders width, median). These missing-capacity links are identified by the flow/capacity ratio > **1. ETMP50 proposes to increase the flow capacity for 4,100 km of federal road sections.**

Improving road conditions - According with the pavement information given by the 10 Years Federal Road Plan 2021, several roads that need pavement upgrading/rehabilitation have been identified and prioritized according with pavement roughness (IRI), traffic volumes and road category. The ETMP model assignments have identified the optimal distribution of upgrading/ rehabilitation works along the 30 years. **ETMP50 proposes to improve road pavement conditions for 5,714 km of federal road sections.**

Missing links - The 10-years Federal Roads Master Plan identified a series of missing links in the national road network, using five criteria: roads leading to economic development potential areas; roads leading to surplus food crop and cash crop growing areas; missing links between main roads or shortcuts; new access to large population centres and roads in emerging regions. 194 missing links were identified for a total of more than 16,000 km, then prioritized with a MCA. The ETMP model assignments have verified the effective traffic volumes of the prioritized missing links and determined the optimal opening years in the three time-horizons 2025, 2035 and 2050. **ETMP50 proposes to build new roads for 10,557 km to complete the federal road network.**

City Ring Roads – To facilitate the pass trough of the long-distance traffic **ETMP50 proposes to build 6 City Ring Road: Mekele, Kombolcha, Jimma, Sodo, Nekemte, Gondar for a total of 392 km.**

EXPRESSWAY NETWORK AND RING ROADS

The model assignments have also identified macro networks corridors in terms of:

- **Construction of new expressways** along those corridors that show a marked increase of transport demand. These new links are identified along the territorial development and regional corridors, presenting a high increase of transport demand which cannot be accommodated with an increase of capacity of the federal road.
- **Construction of national connecting Ring Roads** between the main transport corridors, in order to distribute traffic demand in the different radial directions to the gravitation centre of Addis Ababa

A preliminary evaluation of investments for the new Expressway sections have been conducted using the HDM-4 software, bringing to very satisfying results:

Scenario Go Ahead 2025	Length	Traffic				Upgrade 4 Lanes	Disc Rate 8%	ENPV	NPV/Cost
		2022	2025	2035	2050	Investment Costs	EIRR		
	Km	AADT	AADT	AADT	AADT	Million USD	%	Million USD	Million
Holeta - Ambo Expressway	USD	9,392	9,843	17,456	75,715	156.10	26.6	10,930	6.74
Alem Gena - Woliso Exp	105	6,889	4,954	10,508	42,715	192.99	22.1	9,741	4.48
Dengengo - Harar	27	5,284	3,258	6,339	18,282	49.59	17.8	1,369	2.45
Adama - Awash Junction	115	3,990	8,019	12,064	38,353	211.20	22.3	9,708	5.03

Scenario Go Ahead 2025	Length	Traffic				Upgrade 4 Lanes	Disc Rate 8%	ENPV	NPV/Cost
		2022	2025	2035	2050	Investment Costs	EIRR		
	Km	AADT	AADT	AADT	AADT	Million USD	%	Million USD	Million
Awash - Adaitu Exp.	275	2,884	3,131	4,859	10,318	505.0	17.5	5,524	1.65
Awash - Dire Dawa Exp.	285	5,002	4,092	3,837	11,484	523.4	21.0	24,219	1.97
AddisAbaba - Debre Brihan Exp.	130	2,779	3,492	5,442	28,546	238.7	15.3	4,939	1.90
Addis Ababa - Commodo Abay River Exp.	208	4,289	4,301	8,298	26,951	382.0	22.8	25,461	7.03

Scenario Go Ahead 2025	Length	Traffic				Upgrade 4 Lanes	Disc Rate 8%	ENPV	NPV/Cost
		2022	2025	2035	2050	Investment Costs	EIRR		
	Km	AADT	AADT	AADT	AADT	Million USD	%	Million USD	Million
Awash - Adaitu Exp.	275	2,884	3,131	4,859	10,318	505.0	17.5	5,524	1.65
Awash - Dire Dawa Exp.	285	5,002	4,092	3,837	11,484	523.4	21.0	24,219	1.97
AddisAbaba - Debre Brihan Exp.	130	2,779	3,492	5,442	28,546	238.7	15.3	4,939	1.90
Addis Ababa - Commodo Abay River Exp.	208	4,289	4,301	8,298	26,951	382.0	22.8	25,461	7.03
Commodo Abay River - Bahir Dar Metema Exp.	656	1,604	2,025	3,831	14,867	1,204.75	34.3	34,276	7.2
Ambo Nekemte Mekanajo Exp.	410	1,274	1,459	2,857	10,872	752.97	27.7	23,925	6.19
Woliso Jimma Mizan Teferi Exp.	545	1,416	1,497	2,421	7,649	1,000.90	19.7	11,547	2.2
Aposto - Bitata - Dolo Somali Border Exp.	623	409	451	795	2174	1,144.15	6.6	2,324	-0.202

REGIONAL ROADS: THE RIGHT TO SOCIO-ECONOMIC INCLUSION

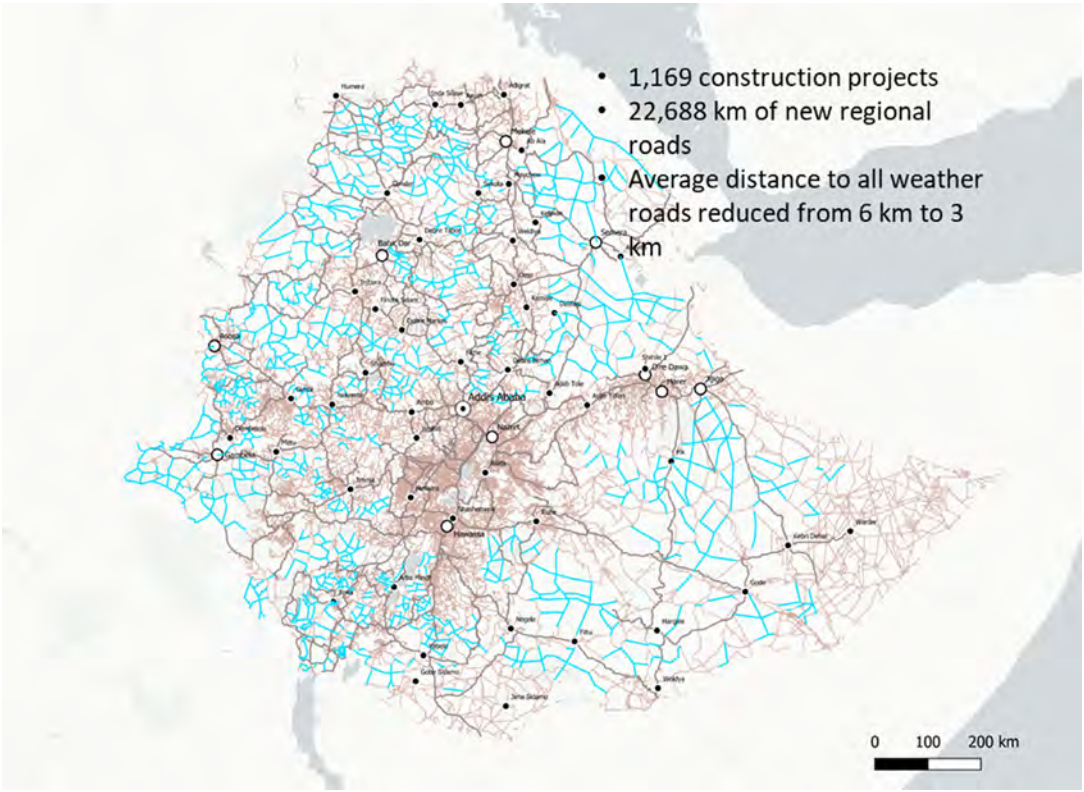
The methodology adopted considers the right of all citizens to socio-economical inclusion, which can only be guaranteed with appropriate infrastructure. In many contexts, including the case of Ethiopia, an increase in rural accessibility has proven effective both in reducing poverty and boosting agricultural production. Thus, it should be considered a priority for all economic growth scenarios.

Where clusters of settlements are identified, new roads are considered to connect these populations to the network. In addition, especially where large areas aren't served by any road, the network density is increased to reduce travel times to major cities and roads.

A considerable effort in the first years of implementation is proposed to increase the accessibility and overall quality of the network.

Then, once the "optimal" size of the network is reached, the plan envisages that the country takes advantage of its assets by properly maintaining the rural road network rather than pushing on its expansion. Considering the recent developments under the different RSDPs, such intervention is considered achievable by 2030, which is considered timeline of horizon for all the construction and rehabilitation interventions.

The total cost of financing the regional road construction, rehabilitation and maintenance by 2030 is estimated as 2.2 billion USD, while the cost of rehabilitation and maintenance for other URRAP and community roads is expected to be 1.52 billion USD. Such investment should be sufficient to grant the country a non-ERA network of 188,532 km of gravel roads in good or fair conditions, which is consistent with the existing network development plans (10 years plan). To achieve this, 1,169 construction projects have been identified. As a result, the average distance to all weather roads after the plan will be considerably reduced for all regions.



Map of regional roads construction projects

REGIONAL ROADS: ESCAPE POVERTY

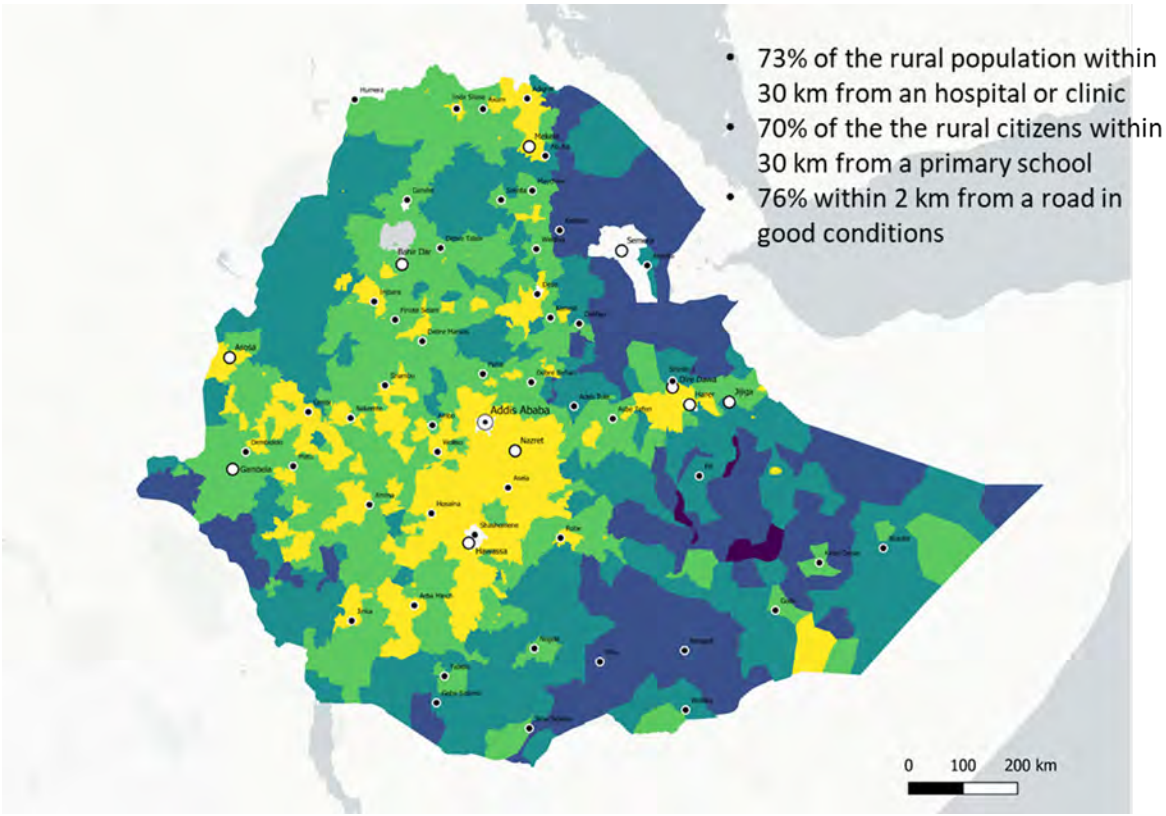
Poor access is a major cause of peri-natal mortality, with an estimated 75% of mortality resulting from inadequate transport to access basic health facilities and/or transport for referrals to hospitals. Therefore, constructing and maintaining rural roads, paths and bridges is key to improve maternal health outcomes and healthier rural communities.

Moreover, rural roads can greatly influence where schools are built, how many rural boys and girls go to primary and secondary schools and how adequately the schools are staffed. According to the Ethiopia Socio Economic Survey Report for the country as a whole, about 72 percent of primary and 73 percent of secondary students can reach the nearest school in less than 30 minutes. Nevertheless, there is a great difference in travel times to schools between urban and rural areas: while only 6 percent of the primary students need more than 30 minutes to reach the nearest school in urban areas, this percentage rises up to 27 in rural areas.

The proposed strategy focuses on the improvement of the rural accessibility indicators such as the RAI, the travel times to markets, the travel times to hospitals, and the travel times to primary schools.

The plan has the aim of improving access to school and hospitals and allow rural communities to reach basic services in a shorter time. In particular the plan will allow 68.7 million rural citizens to be within 30 km from an hospital or clinic, with an increase of 12.9 millions. It will also connect 65.8 million citizens to primary schools within 30 km, compared to the current 53 million.

Overall, 76% of rural citizens will be within 2 km from a road in good conditions.

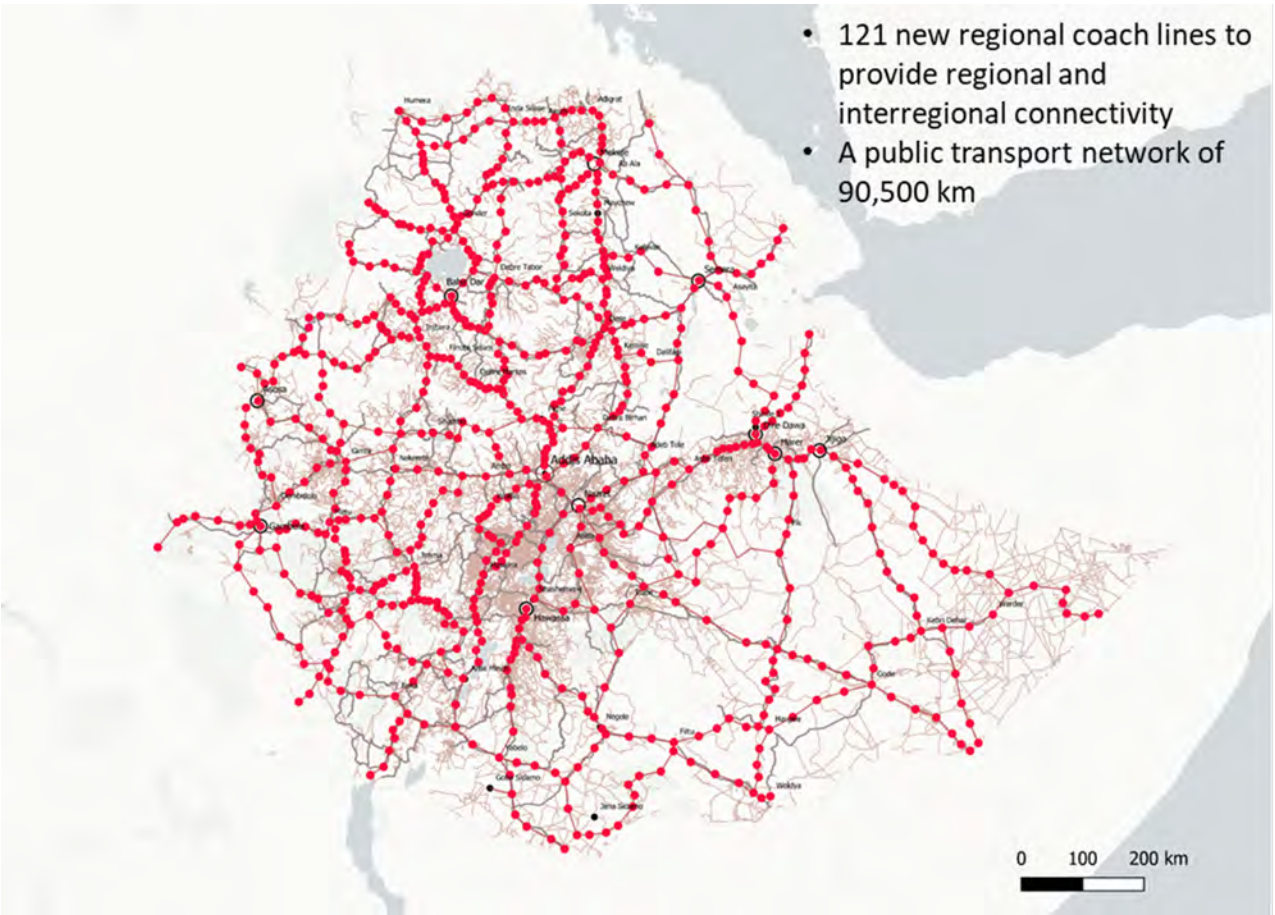


Map of RAI after the plan

REGIONAL ROADS: AN INTEGRATED REGIONAL PUBLIC TRANSPORT

The development of a public transport system is also considered at regional level to provide both accessibility and promote sustainable transport.

For each region it is considered that both regular services and DRT services will be required. While intercity buses will provide regular services between cities along main regional corridors, DRT services will be used as feeder services for local communities to reach villages or transport interchanges. The plan proposes the regional intercity lines and interchanges required to serve the population, with its associated costs. A total of 242 buses will be purchased to run the initial services.



Map of new regional public transport

RAILWAYS

Railway Network

Current Status

Ethiopia started the creation of the national railway network by constructing the Sebeta – Dewale line. Currently, two lines are under constriction: Awash-Kombolcha-Haragebeya (nearly completed) and the Mekelle-Haragebeya.

The sector performance is constantly improving despite some open issues remaining open. Specifically, the need to improve the number and the performance of the loading/unloading facilities and the high level of foreign currency required to manage the daily operation and future constructions.

Infrastructure Network

Short Term

In the short term, the approach is to consolidate the effort and the investments already in place. The foreseen investments include:

- Completion Awash-Kombolcha-Haragebeya and Mekelle-Haragebeya
- Completion of Mekelle-Haragebeya
- Enhancement of the capacity and safety of the Sebeta Dewale line
- Ensure Interoperability between the lines

Medium Term

In the medium term, the connections to ports alternative to Djibouti should be completed. Specifically, the investments focus on

- Dire Dawa – Berbera line,
- Modjo - Moyale line
- Link to Assab line

Additionally, the dry ports of Hawassa, Yebelo and Semera will be connected to the railway network supporting the development of the logistic sector

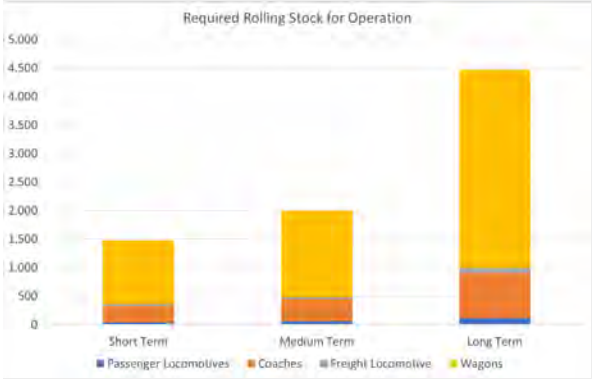
Long Term

The long-term scenario foreseen the completion of the national railway network with the implementation of the links to Sudan and South Sudan and the construction of a national line to improve the connection between the Tana Lake area and Addis Ababa (Finote Selam – Sebeta). Expressly, the investments foreseen the following lines:

- Ethio-Sudan lines
- Connection to South Sudan
- Finote Selam – Sebeta
- Reji – Holeta and Adama Gasera

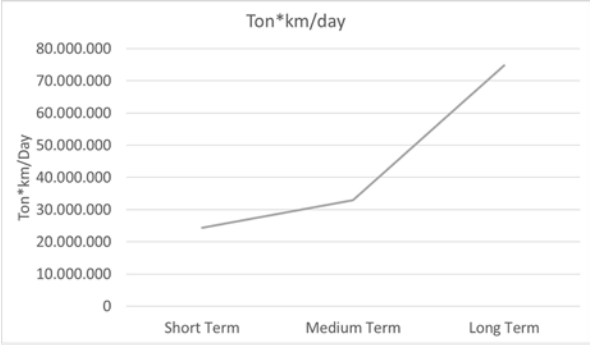
With the foreseen configuration, the Ethiopian railway network will be about 5.400 km long.

Vehicles- Rolling Stock

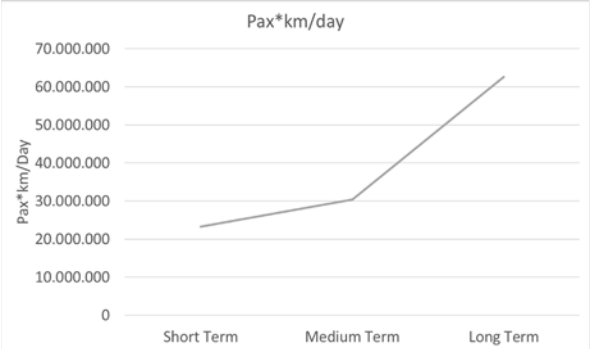


The development of the network should be supported by the development of the rolling stock available for the operation. For this reason, for the evaluation of the investment, also the required number of rolling stocks in terms of locomotives, wagons and coaches has been included. In the long term, the fleet will be composed of about 4.500 items

Services



The daily service provided in terms of ton*km and pax*km is a function of the network development and flows growth. Thanks to the network effect the attractiveness of the railway in the long term is significantly higher and is possible to observe a significant increase in the service



The increase of the rolling stock is not linear compared to the increase of the service due it is foreseen an improvement and optimization in the rolling stock performance leading to an increase the productivity

Integration

The development of the railway sector is not only achieved through the construction of new lines but also with the strength of the integration with other sectors

For this reason, the development of the railway network should be planned jointly with the development of the other infrastructure and particularly roads, dry ports, and airports.

Now, the Sebeta – Dewale line is connected to three main container facilities (Sebeta, Modjo and Dire Dawa). The network will reach 12 facilities connected but will be created opportunities for private junctions and other links to airports

Other Actions

- Establishing the Ethiopian Railway Handbook for design, construction and operation
- Establishment of rail regulatory body
- Establishment of Rail Training and Research Academy
- Development of Ancillary Businesses Programme

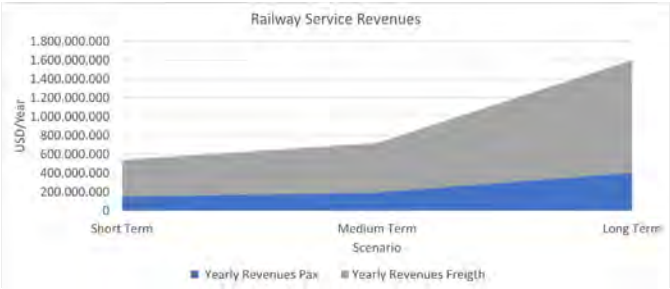
To support the development of the railway sector facing the challenge of dependence on foreign knowledge and technology, the Masterplan has identified even other actions to strengthen the capacity to plan, design, build and operate railways. Specific focus has been given to the implementation of national railway standards ensuring the interoperability among all the lines of the Ethiopian network.

Investments

The foreseen total investments in the Railway sector are about 30 billion USD in the 30 years. More than 50% of these investments are concentrated in the long-term scenario.

The investments are largely made up of the infrastructure costs, with the rolling stock purchasing that is about 10% of the overall investment.

Revenues



Most of the revenues in the railway sector will be collected from freight services. This is because the freight tariff could be considerably higher than the passenger tariff.

AVIATION

- The aviation industry of Ethiopia is highly internationalized and a key contributor to the national economy. It has a long history of constant development and success at different levels. In 2020 the liberalization of aviation sector in Ethiopia was launched to boost further development.
- The national aviation industry contributes to the creation of jobs, brings foreign currency, facilitates international tourism flows to the country, trade and investments.
- The future Ethiopian aviation sector success will rely on two key organizations such as Ethiopian Civil Aviation Authority (ECAA) and Ethiopian Airlines Group (EAG) and on the private sector.
- ECAA and EAG will have to be safeguarded to secure the successful future development of the industry while increasingly opening the different parts of the wider industry to private operators and investors within the ongoing process of liberalization.
- Ethiopian Airlines Group is a recognized industry leader that operates a network of over 128 international and 23 domestic destinations. EAG has ambitious growth plans in international passenger and cargo transport and at industrial level. While focusing on international expansion remains key, EAG will have to invest more to connect the domestic market destinations with more flights, upgraded airports and services.
- Ethiopian Civil Aviation Authority is the key actor of Ethiopian aviation. ECAA's international dimension is significant and set to grow for services provided to the many airlines that land at Ethiopian airports or use the national air space. The Authority that was highly recognized for its Safety Audit Compliance rate by ICAO, will have to be secured resources to pursue development and expansion of air transport sector while acting as the regulating authority in an increasingly complex environment, and the provider of all services related to air traffic control and management at the highest industry standards.
- The future poses many challenges to meet air transport needs up to 2050 and to make Ethiopia a stronger player by providing skilled manpower, enhanced infrastructure to serve demand, including tourism and agricultural needs, state of the art technology at all levels, improved assets, upgraded services to the required level, and adequate financial resources for investments.

N.	Air Route Name	Limits to Growth		Next Generation		Go Ahead	
		2025	2050	2025	2050	2025	2050
		Passengers per day (bi-directional)					
1	Addis A. - Mekelle	431.1	3,624.0	471.3	4,996.6	471.3	4,528.4
2	Addis A. - Bahir Dar	695.3	3,144.4	743.9	3,718.4	743.9	3,721.2
3	Addis A. - Arba Minch	351.4	2,689.9	380.6	3,373.2	380.6	3,373.2
4	Addis A. - Jimma	309.2	2,492.5	339.1	3,076.9	339.1	3,079.0
5	Addis A. - Hawassa	323.5	2,141.6	350.8	2,649.4	350.8	2,649.2
6	Addis A. - Kombolcha	288.5	2,043.1	313.8	2,561.9	313.8	2,601.0
7	Addis A. - Lalibela	371.2	2,113.8	397.7	1,859.3	397.7	2,339.7
8	Addis A. - Semera	310.5	1,933.4	336.5	2,295.8	336.5	2,296.9
9	Addis A. - Bale Robe	302.3	1,629.4	324.1	2,048.6	324.1	2,048.7
10	Addis A. - Axum	185.6	1,614.4	204.0	1,999.2	204.0	1,999.7
11	Addis A. - Dire Dawa	275.4	1,637.5	289.1	1,962.2	289.1	1,964.0
12	Addis A. - Kabri Dar	275.2	1,621.8	296.8	1,942.0	296.8	1,942.0

Traffic estimates for the top 12 busiest domestic passenger air routes for 2025 and 2050 in all scenarios show the expected increase in passenger demand.

AVIATION INVESTMENTS

Within the next decades population and mobility demand at all levels are expected to grow significantly.

- A number of projects have been identified for aviation in the 10 Years Perspective Development Plan and in the EAG growth plans. A major future project is represented by the new Addis Ababa international airport hub to be built in Oromia.
- Additional investment projects have been proposed in addition to those already planned in order to create an enhanced and resilient local infrastructure to serve future demand and related traffic that will make possible to reap the benefits of increased connectivity by year 2050.
- A total of 5,5 billion USD of combined investments in aviation infrastructure is forecasted by 2050. Airports will grow from 23 to 32 and 20 new airstrips will be created. In addition, a total range of 6 to 20 billion USD is estimated for the purchase of different kind of aircraft to accommodate passenger and cargo growing demand, this is expected to be a combined effort of EAG and the private sector.
- For the future it will be key to consider aviation not in isolation but in an integrated view considering the broader transportation industry for passengers (business, leisure, tourism) and for cargo needs. The supply of intermodal transport solutions air-road/rail will be needed to successfully integrate transport services on the territory.
- Higher aviation connectivity will help the country rebuild its attractiveness in the international tourism market and attract visitors to all touristic regions. It will also provide better services to domestic demand. Aviation will be a key component of such integrated view.
- It will be key a) to deploy the proposed investments in enhancing physical infrastructure and b) to provide resources to the regulating Authority to upgrade its capacity and pursue the development and expansion of air transport sector and air traffic.
- In addition to proposed investments, it is needed to:
    a. Create local public transport services as road/rail links to connect airports to the nearby territory, this is true for the new Addis Ababa airport as well as for regional airports

b. Build dedicated facilities at airports or nearby to support cargo traffic in connection with needs of local businesses and nearby industrial parks or agriculture producers

c. Build facilities to properly store health and pharmaceutical products at regional airports

d. Connect by road the dry ports to the airports to serve cargo demand

e. Create fulfillment centers at/near airports to serve the e-commerce generated demand

f. Create dedicated parking spaces and loading/ unloading areas at airports for all traffic

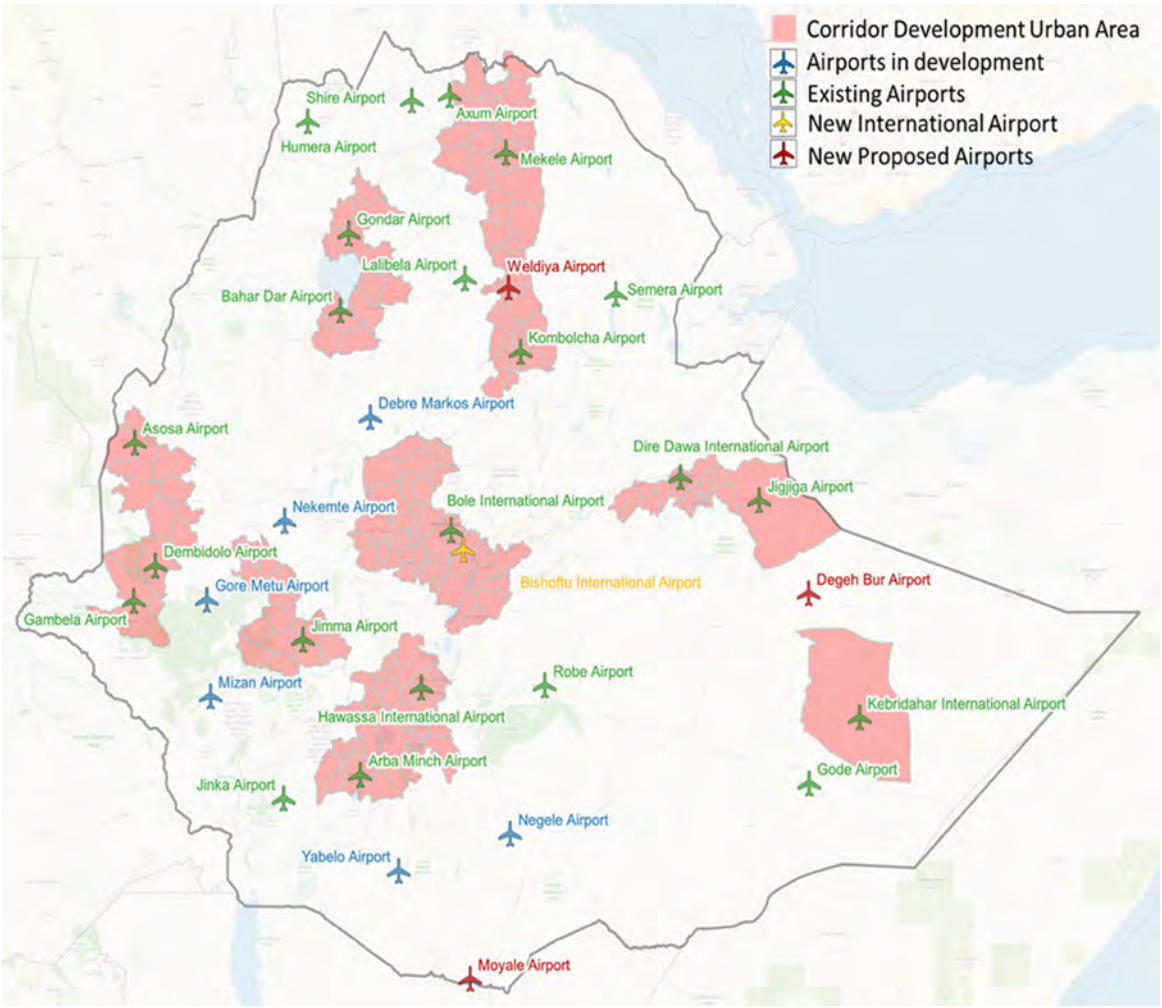
g. Develop local area services to help individuals or businesses in accessing air transport

h. Facilitate the development of retail related services at domestic airports

i. Creating international standard hotels across the country to facilitate tourism growth

j. Develop local tourist attractions to stimulate tourism flows to the different regions

k. Involve the private sector in projects for the creation of new aviation physical facilities and services



Existing and future airports will provide good coverage of the main development growth corridors of Ethiopia as well as areas of interest for tourism development.

Airports will be well integrated with other transport systems in Ethiopia to provide a seamless transport infrastructure for passenger and cargo demand.

LOGISTICS IMPROVEMENTS

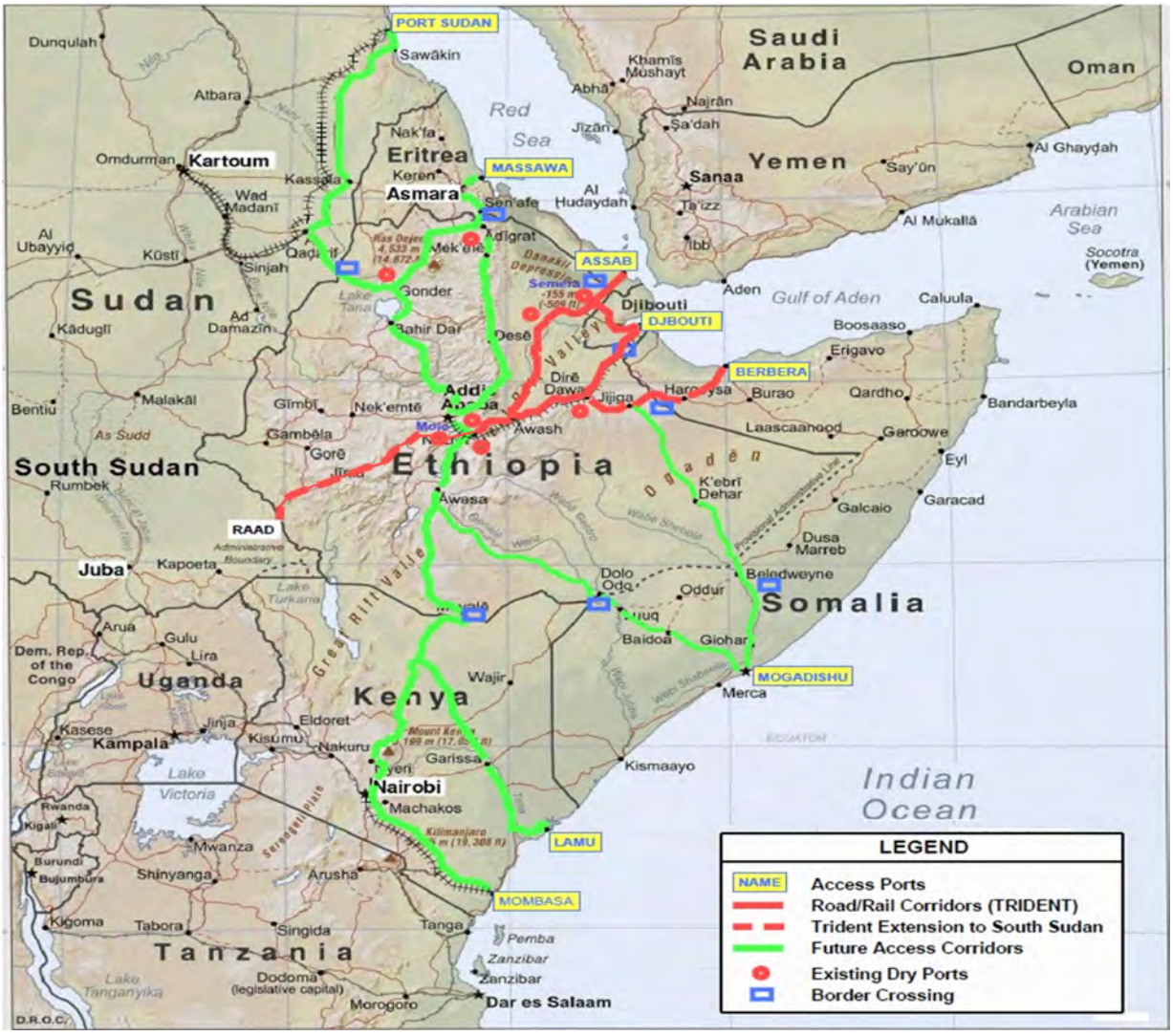
The Logistics investments for the GoAhead scenario in the reference year 2050 are the following:

- **Diversifying Access to Ports,** dominance of North-Eastern Corridors, serving different parts of the country, facilitating border and custom procedures.
- **New Dry ports location:** 2025- Awassa, Assosa, Jimma. 2035 – Gambela, Yabelo. 2050 – Gode, Gondar, Woldiya.
- **Need of new freight heavy vehicles.**
- **Launching the National Logistic Master Plan**
- **Improving cross-border transport regulations**
- **Improving logistic performances**

DIVERSIFYING ACCESS TO PORTS -THE TRIDENT

The dependence on one port, in a foreign country, makes Ethiopia very vulnerable to any unexpected interruptions in supply. Djibouti ports have invested a lot in the last years and continue to improve port services and access roads (RN1, RN18, etc.) so the Djibouti corridor is the predominant corridor and will remain in the future for Ethiopia import/export trade. Moreover, an extension of road and rail infrastructure from Addis south-west till Raad border will enlarge the area served by this corridor to the landlocked South Sudan, transforming Ethiopia also in a transit country.

With appropriate investments also the ports of Berbera and Assab can participate in this north-east south-west important Trident axis, diversifying the possible Ethiopian trade gateways, with partial new infrastructure investment and profiting of Addis – Adama – Modjo expressway/railway and the dominant dry port of Modjo. The Trident will assure the access at three different ports (the nearest ones) which belong to three different nations (Djibouti, Eritrea, Somaliland), stimulating the competitiveness between them and ensuring Ethiopian trade against possible future emergency in one or two of the transit countries.



NEW DRY PORTS CONSTRUCTION

According with ETMP model assignments, new dry ports are needed to be opened at:

Year 2025

Hawassa Dry Port, 550,000 tons. along the Mombasa/ Lamu -Moyale -Addis corridor;

Jimma Dry Port, 800,000 tons along the Addis – Jimma – Raad – South Sudan corridor

Assosa Dry Port, 150,000 tons along the Addis – Gimbi - Assosa – Sudan Corridor:

Year 2035

Gambela Dry Port, 590,000 tons along the Addis – Gimbi - Gambela – South Sudan

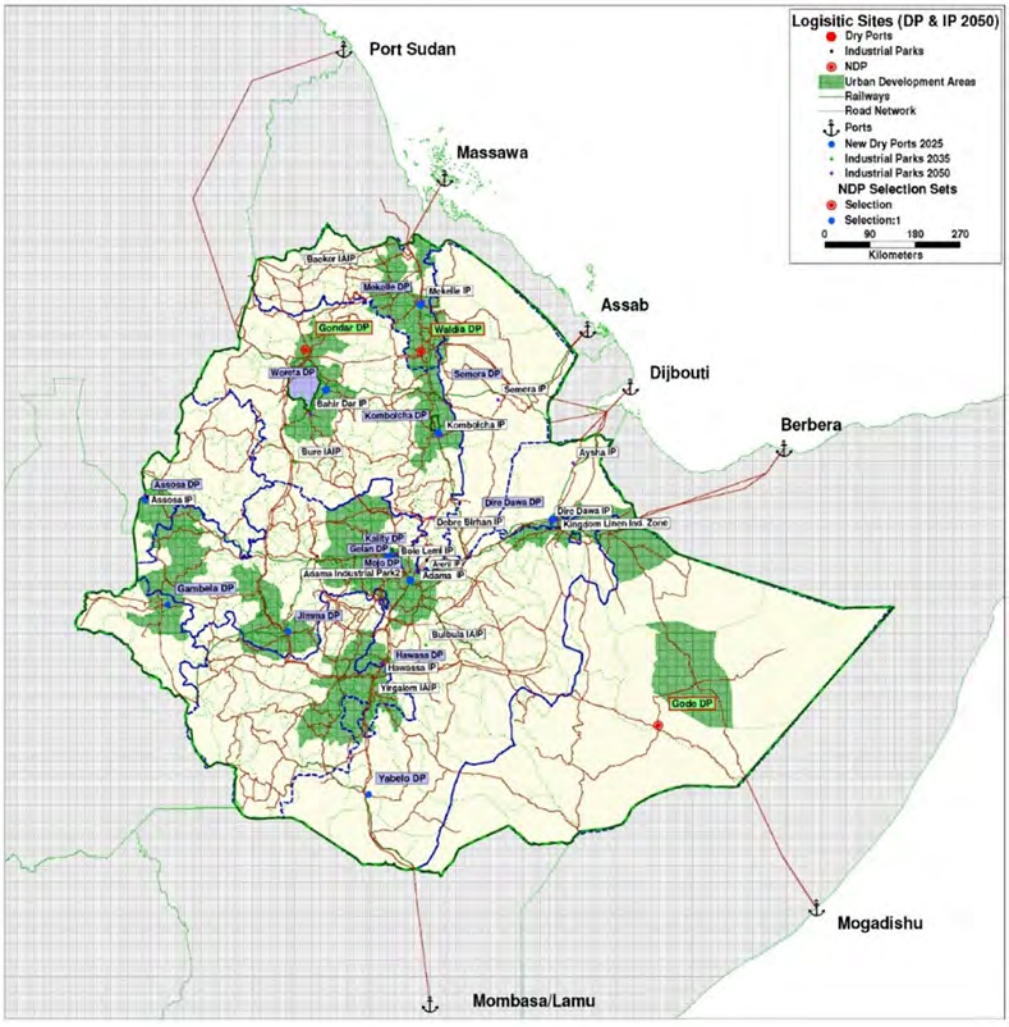
Yabelo Dry Port, 530,000 tons along the Addis – Yabelo – Moyale Mombasa/Lamu corridor.

Year 2050

Gode Dry Port, 4,400,000 tons along the Addis – Shashamene- Gode – Somalia corridor

Gondar Dry Port, 6,000,000 tons along the Addis – Gomdar – Metema – Sudan corridor

Woldiya Dry Port, 8,500,000 tons along the Addis – Kombolcha – Woldiya, Mekelle – Eritrea/Sudan borders.



CROSS-BORDER TRANSPORT HARMONISATION

In order to face the challenges of the coming AfCTA and make Ethiopian logistics corridor competitive at continental level, a focused action to remove cross border barriers is requested. The main issues are as follows.

AXLE LOAD LIMITS - Unharmonized axle load limits, gross vehicle weights and/or maximum vehicle dimensions represent a significant regulatory burden for transport operators, as they encourage transhipment at borders. Ethiopia has implemented its own axle load limits that are not fully harmonized with COMESA. In view of AfCTA negotiations, COMESA standards will likely be a reference for continental common rules.

CROSS-BORDER TRUCKING - In the East African Community (EAC), a Regional Agreement governing trucking operations in the Region is in force since 1998. Originally concluded by Kenya, Tanzania, and Uganda with the name of "Tripartite Agreement on Road Transport" (abbreviated with the acronym "TAORT"), the agreement has subsequently become applicable to Burundi, Rwanda and South Sudan too. Currently, in the EAC, transporters can move freely from a country to another without any restriction. Ethiopia is not a signatory of this Regional Agreement but in view of AfCTA implementation, this agreement will be a standard reference for continental common rules.

CARRIER'S LICENSE - Currently the COMESA Carrier's License allows transport companies with commercial vehicles registered in a COMESA country to operate in other COMESA member States on the basis of a regionally recognised license, without the need to obtain a cross-border road permit for each country where they enter.

Although both Ethiopia and Kenya have agreed to apply this measure, Ethiopian authorities still do not allow Kenyan commercial vehicles to enter their territory for picking up or delivering cargo without a temporary cross-border road permit, whose validity is usually 15 days that must be shown to Customs at both arrival and exit from the Ethiopian border. As stated below, also in this case AfCTA implementation will proceed to remove this kind of non tariff barriers.

CARGO INSURANCE - The cost of freight insurance is reported as high in many African countries, like in Ethiopia or Zimbabwe, where it significantly contributes to increasing the cost of transport. Premiums for insurance of cargo are not only influenced by security conditions of the road, but also by regulation in force. Also in this case the deletion of such a kind of barriers is a target of the AfCFTA implementation and the overcoming of the monopoly of national insurance company should be reached.

LOGISTICS STRATEGIC GOALS

Conversely to railways sub-sector, Logistics accounts a long-time experience in managing the trade flows of goods that are crucial for the country. Despite this long-time operational experience, the performances of the sub-sector are unsatisfactory and the governments issued a National Logistics Strategy in order to enhance the effectiveness and efficiency of the sub-sector.

The opening of the businesses of Multimodal transport and Dry Ports have to proceed together with a review of the mission of ESLSE which has to be relieved from the sunk burdens related to the security of logistics flows (see below the specific regulatory measures).

The public enterprise has to be put in the same conditions of private operators to operate in a liberalised environment in order to improve the competitiveness of national / international corridors.

INLAND WATER SECTOR

The potential of river transport is generally small, being confined to local movements, most useful where there are no roads or the roads are only seasonal. Lake transport has more potential and is particularly important on Lake Tana, where services to the islands and for tourists have a long tern future. In the south, tourist services on Lakes Abaya and Chamo, near Arba Minch, also have potential

The management of inland waterways requires integrated and coordinated institutional arrangement for effective and efficient use. The Constitution of the Federal Democratic Republic of Ethiopia provides power both to the Federal government and regional States pertaining the development, administration, and regulation of inland waterway sector.

The strategic goals at sub-sectoral level can be defined as follows.

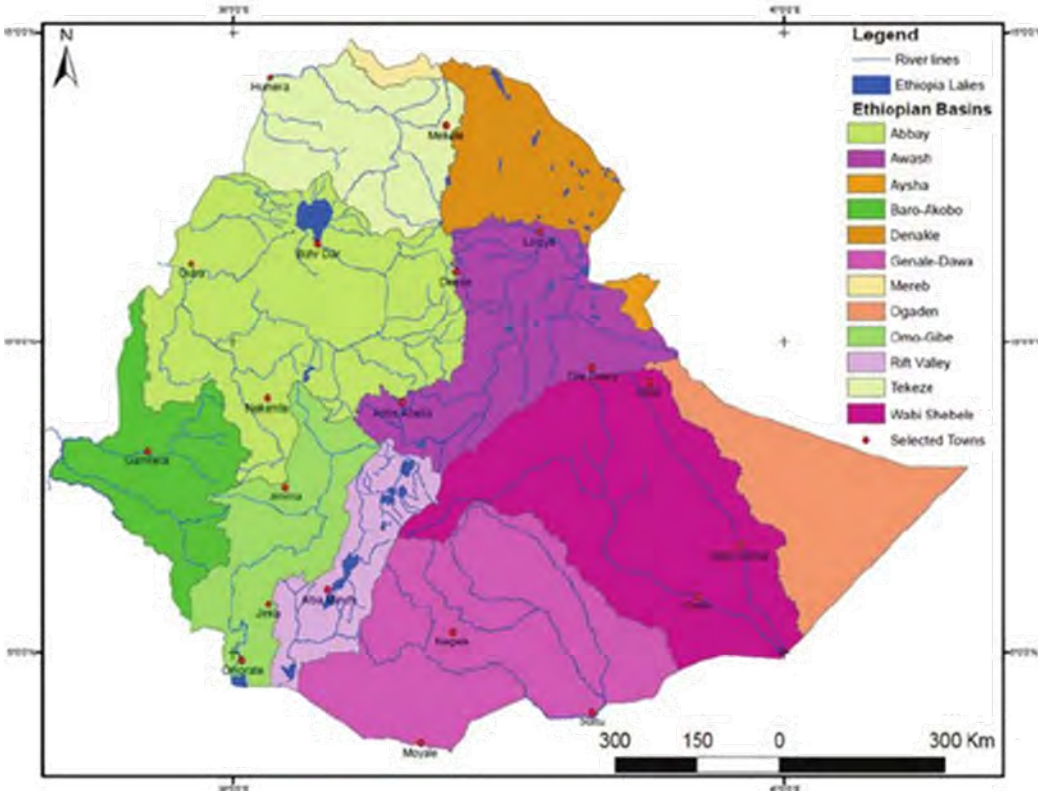
Establish a suitable level of horizontal coordination among transport activities and all the activities related to the rivers and water use.

Support, at Federal level, the Regional administration, to develop investment and service providing development.

Set up the legal framework by drafting the basis rules for service providing.

Improve the professional capabilities of the sector.

The real starting point of the sub-sectoral development is a study to understand the potentialities of Ethiopian river basins in terms of navigation. An Inland water transport study team / committee shall be organized by the Basin Development Authority or other Ministries concerned, to understand which rivers are suitable for water transport and which kind of investments are needed to make it possible. Based on the results of the study the MOTL shall establish a Coordinating and Follow-up Unit for inland water transport sub-sector with the task of plan and prioritize the projects, establishing the needed connections with the Regional States level.



Water Resources and Irrigation Development in Ethiopia - International Water Management Institute

At the same time MOTL, with the support of EMA, should work to fill the regulatory gaps detected. The legal areas to be improved concerns the navigation rules, the safety issues and the insurance system for service providing. All the areas needs to be implemented, looking at international benchmarks and at the domestic experiences of the road sub-sector, which has successfully implemented such kind of processes years ago.

The country has 12 river basins, represented in Figure. Ethiopian waterways generally have a torrential regime. The major rivers cannot be excluded from the strong floods that occur essentially in the rainiest semester. In the lower course the waters often disappear from the surface, but are found at a modest depth. The potential of the following will be verified as a matter of priority:

- Abbay;
- Baro-Akobo;
- Omo-Gibe;
- Rift Valley;
- Tezeke.

The major tasks:

1. undertake a detailed assessment of inland water transport capacity
2. identify the major bottlenecks and capacity constraints
3. develop 20 years inland water transport development master plan based on the assessment of economic and financial returns and seek to promote private sector participation where appropriate
4. develop a strategy for reforming the inland water transport
5. evaluate the management structure for existing and future investments, such as the potential for private sector financing and management, and public-private partnerships

The studies and analyses carried out in the maritime and inland waters sector concerned:

- demographic analysis of cities closes to or falling within the 7 water bodies of Ethiopia;
- analysis of the national parks and reserves existing in the country,

in addition to existing seaports linked to Ethiopia and sector plans such as Ten years perspective plan (2020-2030), discussed in the previous chapters.

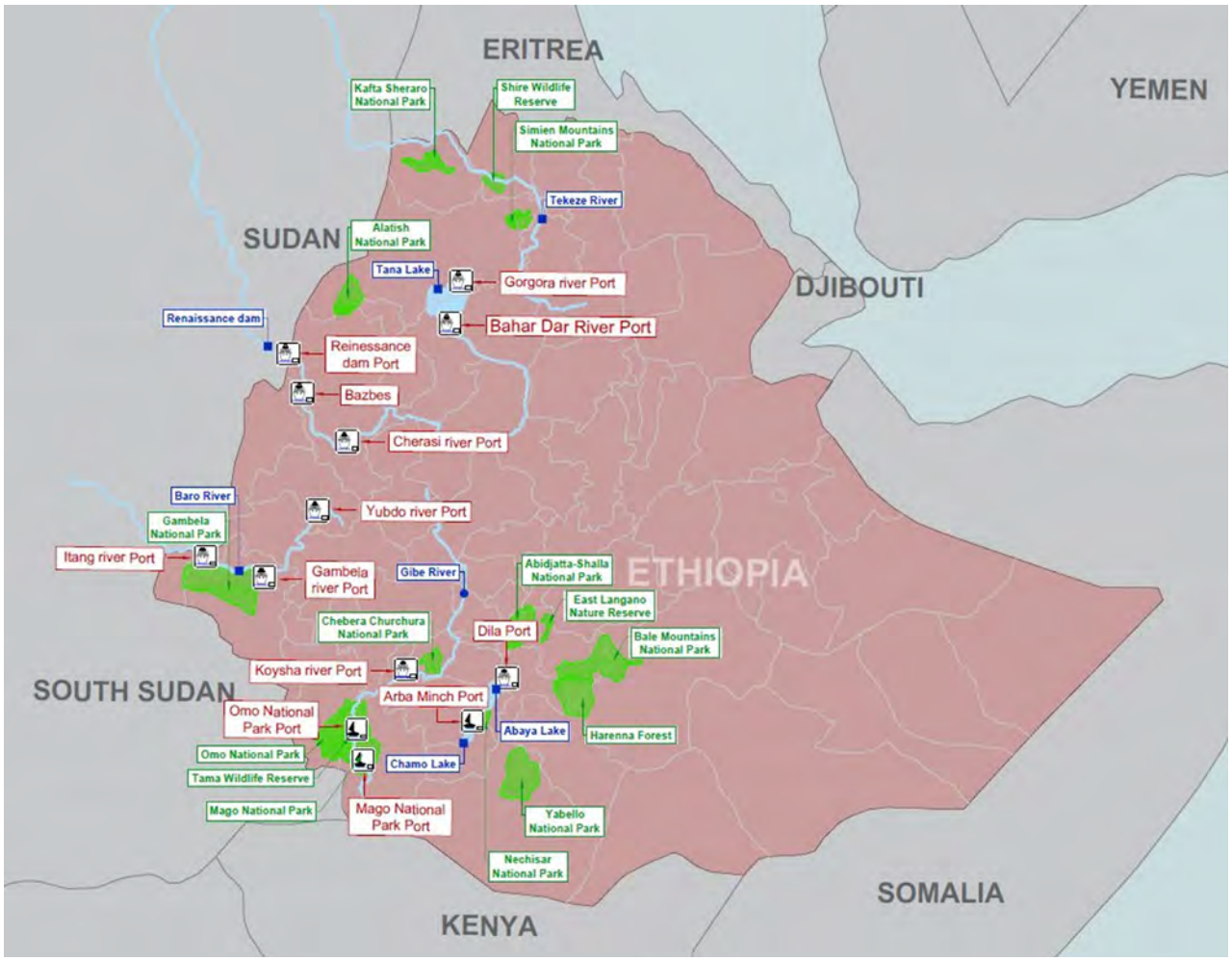
Based on the studies conducted, design solutions have been designed for new river ports to be realized in Ethiopia in order to improve internal trade links and promote tourist transport in the country, and in particular in the national parks / reserves existing in Ethiopia.

By the studies and sector analyses carried out, the most strategically important cities in which to build new port infrastructures have been identified.

The design solutions of new port are two:

- the Design solution 1 consists in the realization of a “full port” characterized by:
  - » Commercial Port Area;
  - » Fishing area and shipbuilding;
  - » Passenger Area.
- the Design solution 2 consists in the realization of a port characterized by only Passenger Area.

The main characteristics of Commercial Port Area are Operating Docks (APRON) with Mobile cranes (10 and 30 t); Floating platform for RO-RO; Terminal area (Office and Service Buildings; Indoor and outdoor storage areas; Storage in transit; Equipment storage and workshop; Installations; Safety and Security).



Design Solution Map

The Design solution 1 is planned in:

- **Tana Lake:**
  - » Bahar Dar
  - » Gorgora
- **Blue Nile:**
  - » Renaissance Dam
  - » Bazbes
  - » Cherasi
- **Baro River:**
  - » Gambela
  - » Yubdo
- **Abaya lake:**
  - » Dila
- **Gibe River:**
  - » Koysha

Furthermore, the Awash and Wabi Shebelle rivers can be investigated and studied with Feasibility Studies.

The Design solution 2 is planned in:

- **Chamo Lake:**
  - » Arba Minch
- **Gibe River:**
  - » In the Tama Wildlife Reserve
  - » In the Mago National Park

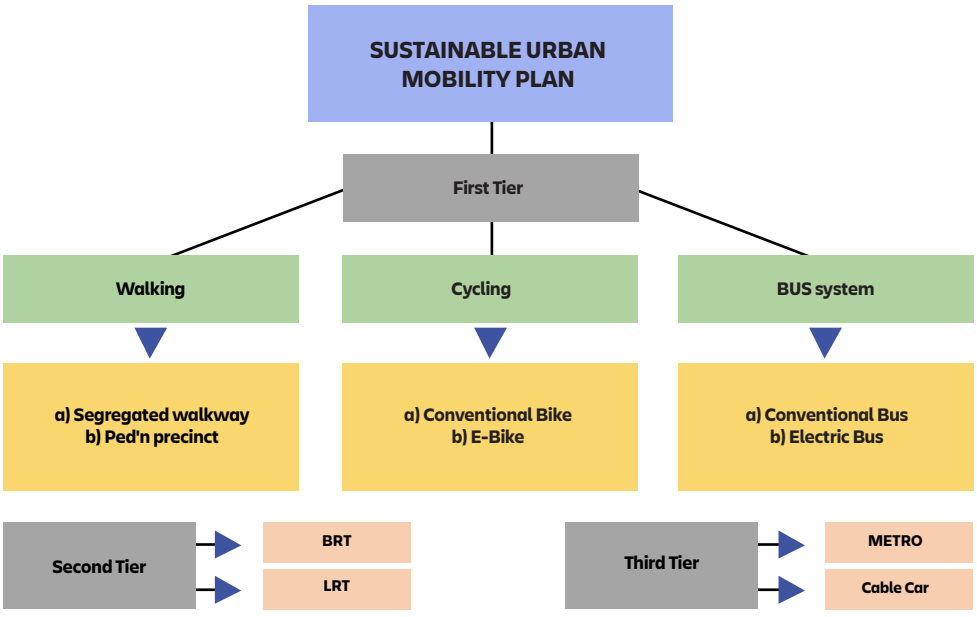
SUSTAINABLE MOBILITY (SUMP) FOR ALL THE CITIES

The Sustainable Urban Mobility Plans (SUMPs) drafted by several cities in Europe following the European Commission Guidelines for Sustainable Mobility (LGE - ELTIS) are of immense strategic value for Ethiopia's sustainable mobility management, adopting this tool, merging strategic mobility and urban planning in Ethiopia: it should be used on all urban settlements, aggregating settlements when necessary to reach a minimum of 100,000 inhabitants.

The SUMP goes together with;

Integration of different transport systems

- Maintenance and development of public transport
- Consistent development of pedestrian & NMT and cycling mobility systems and consequent reappropriation of public spaces dedicated to people and not just to cars.
- Introduction of shared motorized mobility systems (MaaS).
- Renewal of the vehicle fleet with the introduction of low environmental impact and less polluting vehicles.
- Rationalization of urban logistics.
- Diffusion of the culture connected to sustainable mobility and the integration of urban planning processes with those of mobility
- Develop where needed additional mass transit means, like BRT, LRT, Metro, Cable car, etc,



Implementation of SUMP for all cities in Ethiopia

INTERURBAN LONG-DISTANCE MOBILITY

It is most urgent to intervene in the Interurban/intercity corridor connections, given the vastness of the country and absolute need to connect the numerous urban centres in a continuous, efficient, safe and convenient way and at an affordable price, starting with those located along the development corridors.

For projections purposes, the public transport needs have been derived from the data of the origin/destination surveys carried out in 2020 and the growth forecasts of the evolutionary scenarios illustrated in the previous chapters. The basic data is the passenger per Km per day, revised for each of the identified corridors.

The total number of passengers per km per day is almost 60 million, increasing to over 100 million by 2035 in all three scenarios, reaching over 350 million in 2050 in the scenario called Next Generation, 357 million in Go Ahead and 335 in Limits to Growth. In other words, in all three scenarios, the mobility calculated as passengers per km per day doubles in 2035 and sextuples in 2050.

The projections for long distance buses were calculated according to the traffic models developed for the three different scenarios and with different estimates of technological and power composition of the fleet for each scenario. In all three scenarios, a diesel-powered fleet is still expected by 2025, a gas-powered fleet by 2035 with the introduction of electric vehicles, and by 2050 a fleet composition where 10% hydrogen is used as a fuel in one scenario, then electric batteries and gas. Electric vehicles are not expected to be present only in the most negative scenario. The number of vehicles remains for the first to scenario (Next Generation and Go Ahead) the same as this depends on the traffic, population increase and GDP forecast base models.

Actions to be taken are:

- **Establishing the public transport Mobility Agency**
- **Intercity bus purchase**
- **Establishing intercity public transport services**

AGENCY FOR MOBILITY - A NEW MANAGEMENT TOOL FOR CORRIDORS DEVELOPMENT

As the future demand will grow differently according with the key drivers mentioned above, the future flows of mobility along the development corridors calls for specific institutional tools to be established. In the long term, each corridor should have its Mobility Agency, able to plan and manage the supply of mobility services within the corridor.

The need of Corridor Mobility Agencies means recognizing that corridors are homogeneous in terms of mobility needs, as they express not only a much greater propensity to move than in rural areas but also a variety of travel motivations that need evolved, coordinated and integrated mobility systems.

To this end, the future path includes the following actions:

- Define the development corridors that require a corridor agency
- Define the CMA road map, identifying a first group of corridors in which to establish agencies

POLICY AND REGULATORY MEASURES

ROADS

The road subsector is the backbone of the national transport sector, this primary role will remain in the coming decades. The main pillars of sub sectoral policies can be summarised as follows:

a. Develop the road transport capacity towards an integrated system of infrastructures, terminals and vehicles.

b. Provide a suitable level of transport services produced by public or private operators

c. Improve the sustainability of the road sector and minimize the impact of road mobility (collective and private vehicles).

d. Enhance the ability and the skills of institutions' officials and employees.

An appropriate investment program, coordinated with the needs of the demand for mobility, is the fundamental tool for adapting the transport capacity to the needs of the demand. But the main sub-sectoral regulatory measures must first of all create the conditions for a generalized increase in the supply of public transport services: in urban areas, along development corridors and in rural areas.

In order to do so the regulatory framework must be improved, by introducing the concept of Public Service Obligation, providing suitable budget to Regional States to finance it, establish competitive procedures to assign PSO in order to minimise the financial disbursements.

The sustainability of the future level of mobility flows requires introducing the Environmental Impact Assessment for new infrastructures, introducing incentive measures for low-impact road vehicles, and continuing to implement the Road Safety Policy and the Non Motorized Strategy.

The effort to adapt the ability of sub sectoral institutions is twofold: on one side to operate to build and consolidate the basic skills at local level, focusing interventions on Regional States' authorities (both RRAs and Regional Transport Bureaus). On the other side to both reinforce the ability of the weaker institutions at national level and to prepare a new set of skills suitable to cope with the issues arising from the privatisation/ liberalisation dynamics.

RAILWAYS

Railways can be considered as an almost new sub sector for Ethiopia. Given the similarities with the aviation sector, it is extremely important to learn from the lessons that can be drawn from its development. In particular, the time factor is of fundamental importance: time must be given to the railway system to develop its basic requirements and to consolidate the experience of the first years of operation. Accordingly, the main pillars of sub sectoral policies are as follows:

a. Strengthen the start-up of the sub-sector.

b. Review the governance of the sector and improve the regulatory framework.

c. Prepare the opening of the market towards a stepwise railway privatization.

d. Define the standards of the system to guarantee internal and international interoperability.

e. Build and develop a system of fundamental skills to grow railway professionalism.

The railway sub-sector needs first of all to consolidate itself, increasing the services offered, their quality and completing the lines under construction. But at the same time a governance review must be undertaken to allow for future development on a clear basis, identifying an infrastructure manager and a service provider. The regulatory framework must also be completed at basic level, with the institution of the safety agency and, in the middle term, by enlarging its scope to the economic regulation.

The technical complexity of railways calls for the definition of national standards, to be coordinated with the process of African Trade Agreement and, moreover, with the creation of a robust technical knowledge base.

LOGISTICS & MARITIME

Objectives and measures stated in the National Logistics Strategy and in the National Logistics Policy are the main development program and it this strongly suggested to implement it. But further policy pillars are requested in order to complete that program:

a. Define a clear economic framework for the security of trade flows.

b. Define and implement the economic and regulatory framework in view of market opening.

c. Exploit the potential synergies between railways and logistics sub-sectors.

As logistics is crucial to ensure the security of Ethiopian trade flows, the mission of the Public Enterprise goes beyond a simple business scope but is often related to the pursuing of the national targets. In order to make this issue consistent with the opening of the logistics market to private operators, it is requested to define a framework of Public Service Obligation for the ownership and management of the naval fleet, assigning to ESLSE the providing of the service(s) on a contractual base.

In order to make substantial progress in private's participation to logistics business, it is necessary to clarify the liberalization approach. It is suggested to update the National Logistics Policy towards the open access approach in order to avoid monopolistic positions hampering the credibility of liberalization.

The competitiveness of the national logistic system calls for a forward-looking approach, going beyond the current concept of "Multimodal transport". It is necessary to capture the opportunities arising from the integration of road and rail systems, dry ports, cargo airports and facilities, logistics services, industrial and agro-industrial parks, able to supply a network of services to move goods throughout the country.

AVIATION

As Ethiopia is a leader in continental air transport, the country can use this strength to develop its domestic market, helping to create important alternative mobility solutions to road transport. This target should be one of the policy pillar of the sub sector, the others being as follows:

a. Prepare the AfCFTA implementation (SAATM) leveraging the competitive positioning of the country.

b. Reinforce the capabilities of the regulatory institutions (ECAA, EAAIB) and of the workforce.

c. Make sustainability a priority for the Ethiopian aviation industry.

The implementation of AfCTA finds Ethiopian aviation in a position of competitive advantage. This position has to be defended, leveraging the benefits of being the main actor of the market, able to guide the process without hampering the growth of other continental operators, but considering the expected growth of the demand in a scenario of liberalization. In the middle term, a direct control of EAL of the airport network could be not consistent with an open market, so alternative options of separation should be analysed and prepared.

A crucial role on this issue will be that of Civil Aviation institutions (ECAA, EAAIB). Improving Civil Aviation capabilities is essential, not only to make effective the development of the domestic market, but also to prepare a positive implementation of the African trade agreement. The main field to be considered are air traffic management, technical and economic regulation, aviation safety, signalling equipment and structures.

These considerations do not only have a strategic or policy implication, albeit fundamental, but also concern technological aspects, which require investments that allow the country to propose themselves as a supplier of navigation services for other countries, extending their leadership from the commercial sector to that of the institutions.

Also sustainability is an important issue in this sub sector. It is necessary to prioritize aviation sustainability, by establishing ESIA procedure for new airports/airstrips.

URBAN TRANSPORT

Urban and Public transport is closely connected to Roads, accordingly it shares an important part of its policies with the that sub-sector. The main policy pillars can be summarised as follows:

a. Providing and promoting sustainable connections in all the country's areas.

b. Develop a suitable regulatory framework and enhance the institutions' capabilities.

c. Promoting sustainable behaviours and patterns of mobility.

Al transport operators will have to evolve towards more structured and efficient business models, investing in systems (infrastructures, vehicles, technologies) able to meet the mobility needs and to reduce the impact of mobility itself. In order to make it possible, it is requested to design and set up both planning and regulatory tools able to meet the future demand needs: Public Service Obligations, Public Service Contracts, Sustainable Urban Mobility Plans, Corridor Agencies.

At the same time, by adopting the SUMP approach the concept of mobility will have to evolve, giving role to Non Motorised Mobility and incentivise the citizens' behaviour towards the choose of less impacting mobility.

INLAND WATERWAYS

This sector is new in the Ethiopian landscape, it needs to be developed starting from the basis of regulation and with the full awareness that water resources have multiple users, not only for transport. Accordingly the main policy pillars are as follows:

a. Establish a suitable level of horizontal coordination among transport activities and all the activities related to the rivers and water use.

b. Support, at Federal level, the Regional administration, to develop investment and service providing development.

c. Set up the legal framework by drafting the basic rules for service providing.

d. Improve the professional capabilities of the sector.

INVESTMENTS PROJECTS FINANCING AND PPP ELIGIBILITY

In recent years the FDRE Government has paved the ground for an effective Public-Private-Participation policy. Based on this regulatory framework, the eligibility of all the major investments for a PPP scheme has been explored and the results are promising if the further regulatory arrangements will be shaped accordingly.

Out of the 16 new expressways envisaged in the plan, six can be eligible, if the revenues expected can be increased by 65% (by mixing a 30% of tariff increase and a 35% of current grant to the private investors). This framework allows investments in Expressways by the privates for a total of 5,2 USD Billion.

In the case of the new railways line, the PPP scheme is applicable in case of the liberalization of the service in regime of open access. Under these circumstances the public party could limit the investment to the infrastructure construction, while the needed rolling stock can be an investment of the private railway undertakings, with a saving of the public budget up to 3,3 Billion USD.

The PPP scheme can be applied also to “punctual infrastructures”, like dry-ports and national airports.

Six new dry-ports and six national airports upgrading can be easily financed by PPP, with a cumulative saving for the public budget of 0,9 billion USD.

Financial Internal rate of return for Major Expressways: Raised tariffs/Subsidy granted case

2025	FIRR %
Holeta - Ambo Expressway	11,3
Alem Gena - Woliso Exp	8,1
Dengengo - Harar	4,9
Adama - Awash Junction	6,1
2035	**FIRR %**
Awash - Adaitu Exp.	0,2
Awash - Dire Dawa Exp.	4,6
Addis Ababa - Debre Brihan Exp.	10,5
Addis Ababa - Commodo Abay River Exp.	9,9
2050	**FIRR %**
Awassa - Moyale Exp.	10,2
Adaitu Mile Semera Galafi Exp.	6,9
Alem Gena - Butajira Exp.	17,1
Debre Brihan Mekelle -Eritrean Border Exp.	10,9
Commodo Abay River -Bahir Dar Metema Exp.	13,5
Ambo Nekemte Mekanajo Exp.	10,8
Woliso Jimma Mizan Teferi Exp.	8,5
Aposto - Bitata - Dolo - Somali Border Exp.	2,2

In RED the Projects eligible for PPP

THE TOTAL AMOUNT OF INVESTMENTS

In considering the total amount of investments, it is useful the following classification:

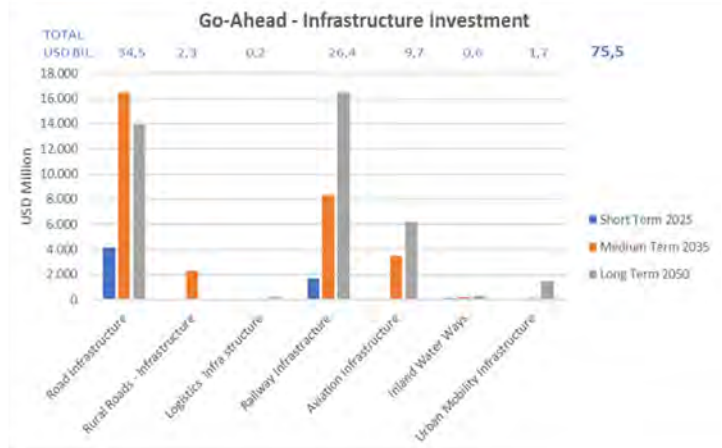
- Infrastructure investments, the one that are a mix of concrete and technologies, and are bound to a specific territory and allow, with public access, transport services to be developed on them.
- Vehicles to be invested by public entities;
- Vehicles to be invested by private entities.

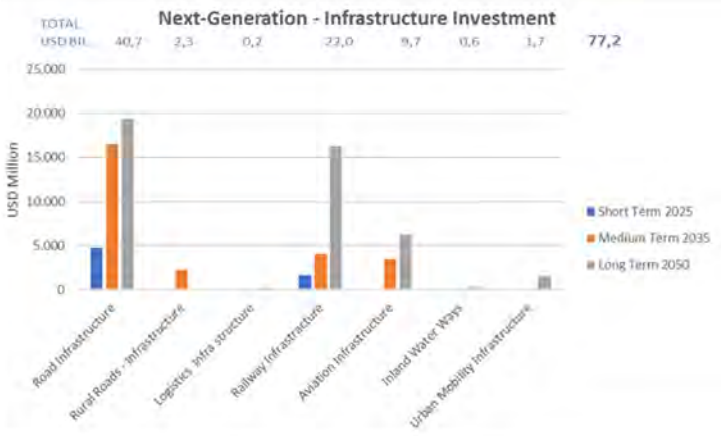
The investments to be done by the public sector is the total of the infrastructure investments plus the vehicles to be invested by public entities. The totals are before any PPP that can be organized for them.

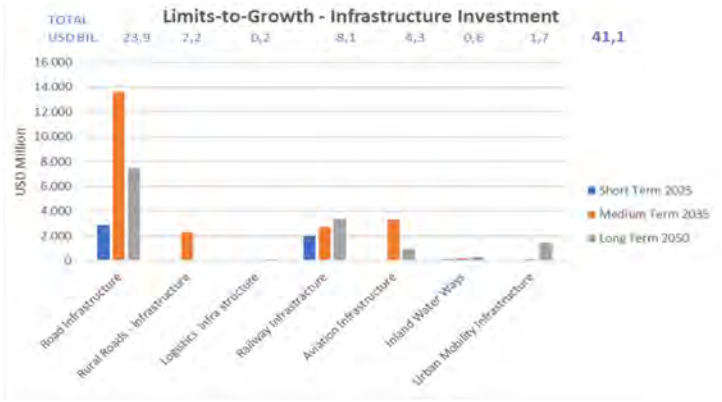
The eligibility for PPP of the investments to be performed by the public sector reach, under the necessary regulatory conditions, the total amount of 9,4 Billion of USD.

INFRASTRUCTURE INVESTMENTS IN THE THREE SCENARIOS

Considering the total infrastructure investments in the three scenarios, in all of them the main investments are performed by the Road sector (included rural roads) and by the railways sector.



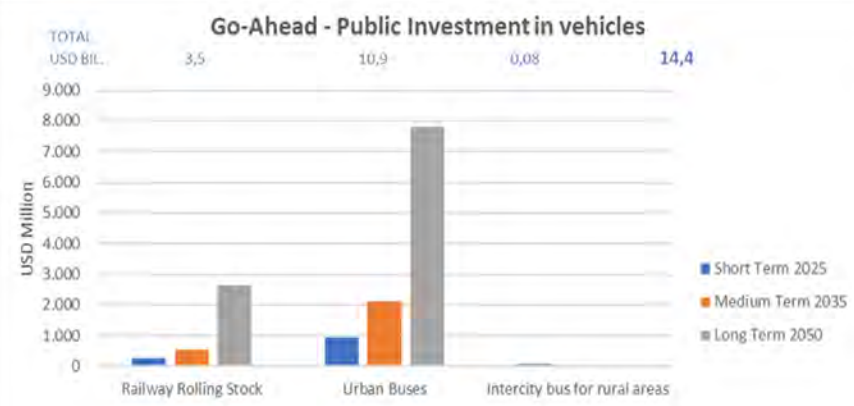


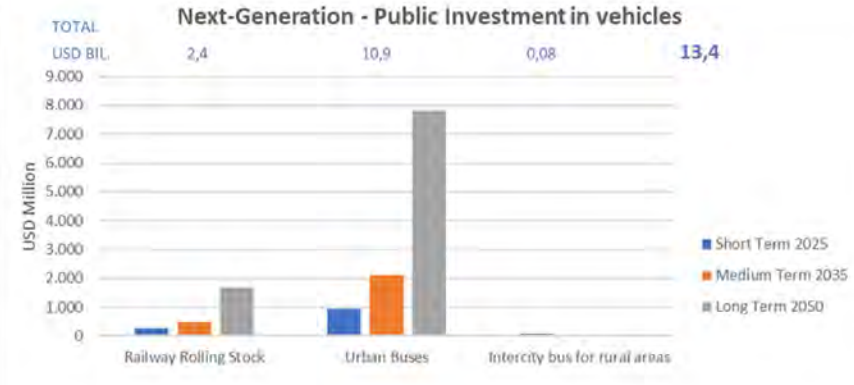


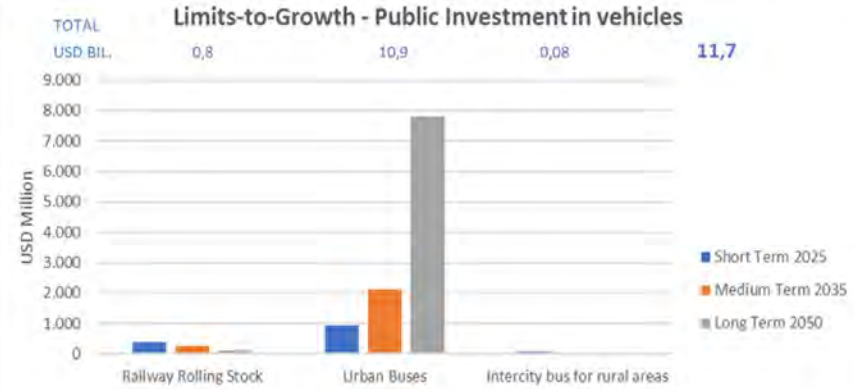
PUBLIC INVESTMENTS IN VEHICLES IN THE THREE SCENARIOS

About the investments in vehicles performed by public entities, they are composed by the rolling stock for railway services (passengers and freight), by buses for urban services and by buses for the services in the rural areas, but requiring typically a subsidy to be economically performed.

In all the three scenarios, the major investments are the one on urban buses, followed by the railway rolling stock. Int can be noted that in the third scenario the rolling stock required is minimized.



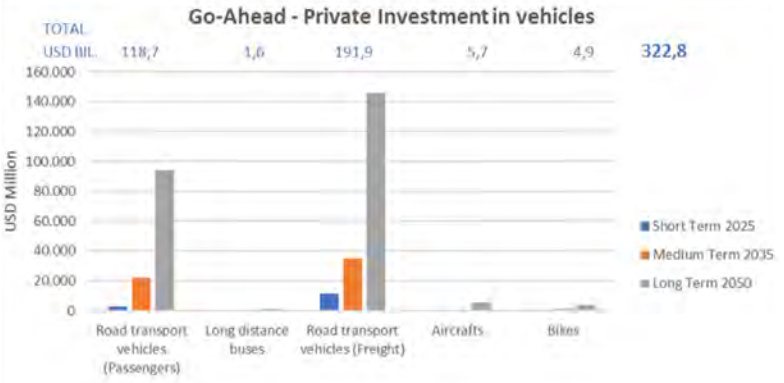


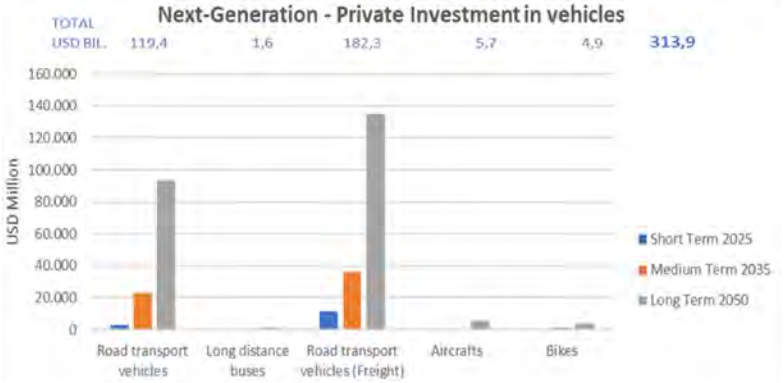


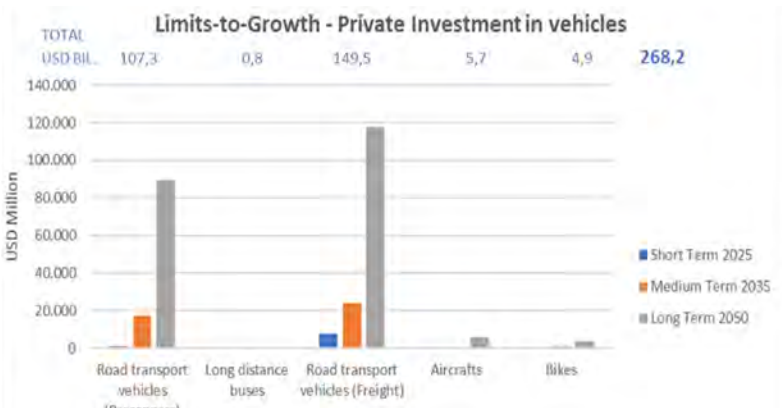
PRIVATE INVESTMENTS IN VEHICLES IN THE THREE SCENARIOS

The investments in vehicles performed by the private sector are composed by road vehicles for passengers, by buses for long distance services, by road vehicles for freights, by aircrafts for national services and by bikes bought by privates as a consequence of the non motorized strategy of the Government.

In this category of investments in all the scenarios the demand for private vehicles has an explosive trend, typical in societies entering in the middle-income belt. Among them, the maximum amount is reached by the road freight vehicles (semi-trailers, trucks, lorries, special vehicles)



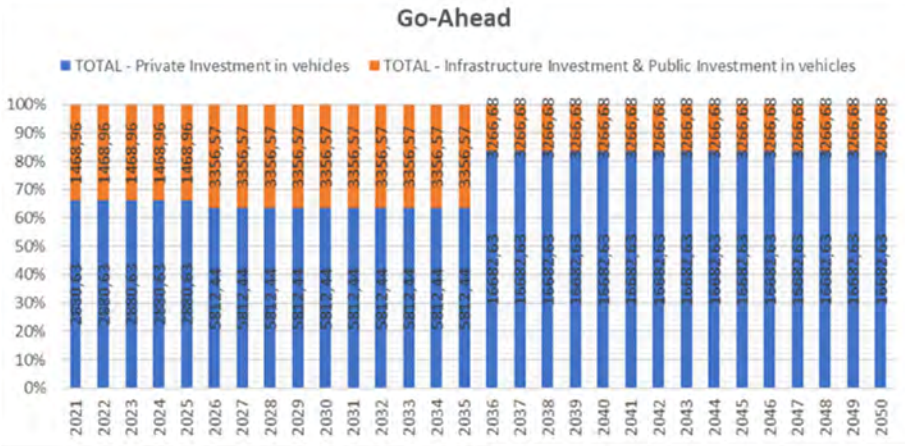


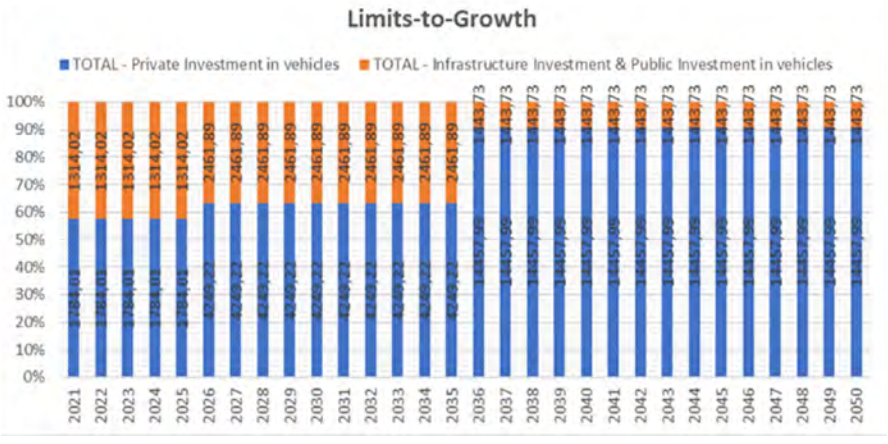


PUBLIC VS PRIVATE INVESTMENTS

Considering the relative amount of investment done by the public sector and by the private sector, it is evident the preminent role of the private sector in all three scenarios, particularly in the « limits to growth» one.

It is crucial thet the regulatory frawerk can create a conductive environment for private investors, both nationals and foreign ones.





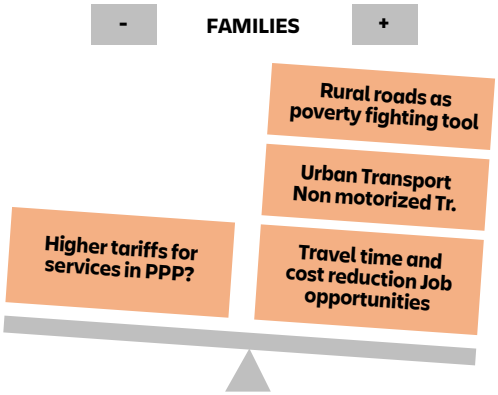
SUSTAINABILITY OF THE TOTAL AMOUNT OF INVESTMENTS

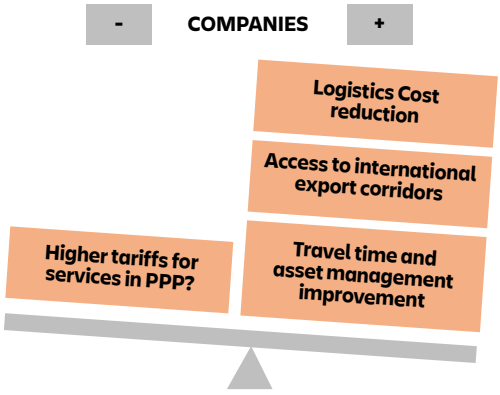
The sustainability of the Investments Plan can be evaluated with reference to the impact to the four basic balance sheets of the economy: Families, Companies, Public Sector, Foreign Trade.

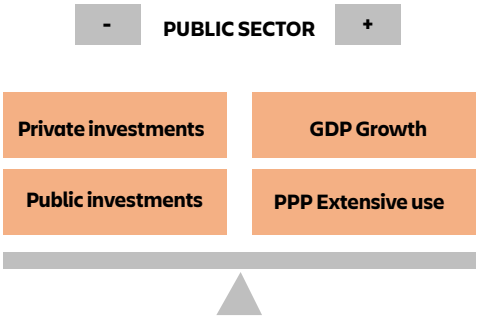
The balance sheet of the families is positive: the Rural roads network enhancement will be a powerful tool for the poverty fighting; in the urban areas the starting of the public service in 70 urban areas exceeding 50 thousand inhabitants, together with the implementation of the non-motorized strategy, will contribute significantly to the quality of life. The new transport services will bring reduced travel time and costs, increasing the consumers rent. Finally, the investment program and the transport sector development will bring relevant job opportunities to the Ethiopian families. On the other hand, some cost increase for the services can derive from a higher level of tariffs induced by an extensive use of the PPP.

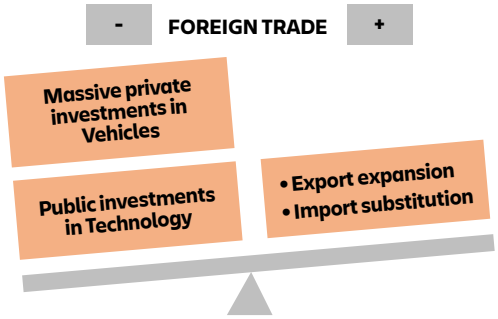
The balance sheet of the companies is even more positive: the most important outcome will be a reduction of the logistics costs, that is an historical point of weakness for the Ethiopian enterprises in the global competition. Further advantages will be to have better access to the international corridors in the framework of the African common trade area, with the related growth opportunities. For the transport companies a better infrastructure means reduced maintenance costs for the vehicles and a reduced cycle time, with a better use of the assets. Also for the companies, some negative effect can come from higher tariffs induced by the PPP schemes. On the other hand, these schemes also constitute investment opportunities for the private Companies.

The impact of the Transport plan on the balance sheet of the public sector appears to be sustainable: the public investments will have an incidence on GDP that is reduced from the ones of the past decade, with a peak in the period 2025-2035 (1,85% of the GDP) and a reduction in the following fifteen years up to a percentage of 0,8% of the GDP.









The impact of the Transport plan on the balance sheet of the Foreign Trade will be the problematic aspect of the sustainability of the Transport Plan InvestmentsThe private sector vehicles investments are expected to boom, particularly in the period 2035-2050. This will be due mainly to road freight vehicles, but also to private cars and buses. The issue should be approached from two different sides:

the export expansion, awaited since several years, should finally materialize. This would help to rebalance the burden that the transport sector risks putting on the international payments;

an acceleration of the Government Programs to create an automotive national industry, already started with alliances with global players to build assembling automotive factories in Ethiopia.

The success of an “import substitution Policy” in the vehicles industries, particularly for the freight vehicles, is a vital element for the economic sustainability of the plan.

ACTIONS

PROJECT DELIVERY: SEQUENCING AND CHALLENGES FOR INVESTMENTS AND POLICY MEASURES

The implementation of the National Transport Masterplan has many challenges.

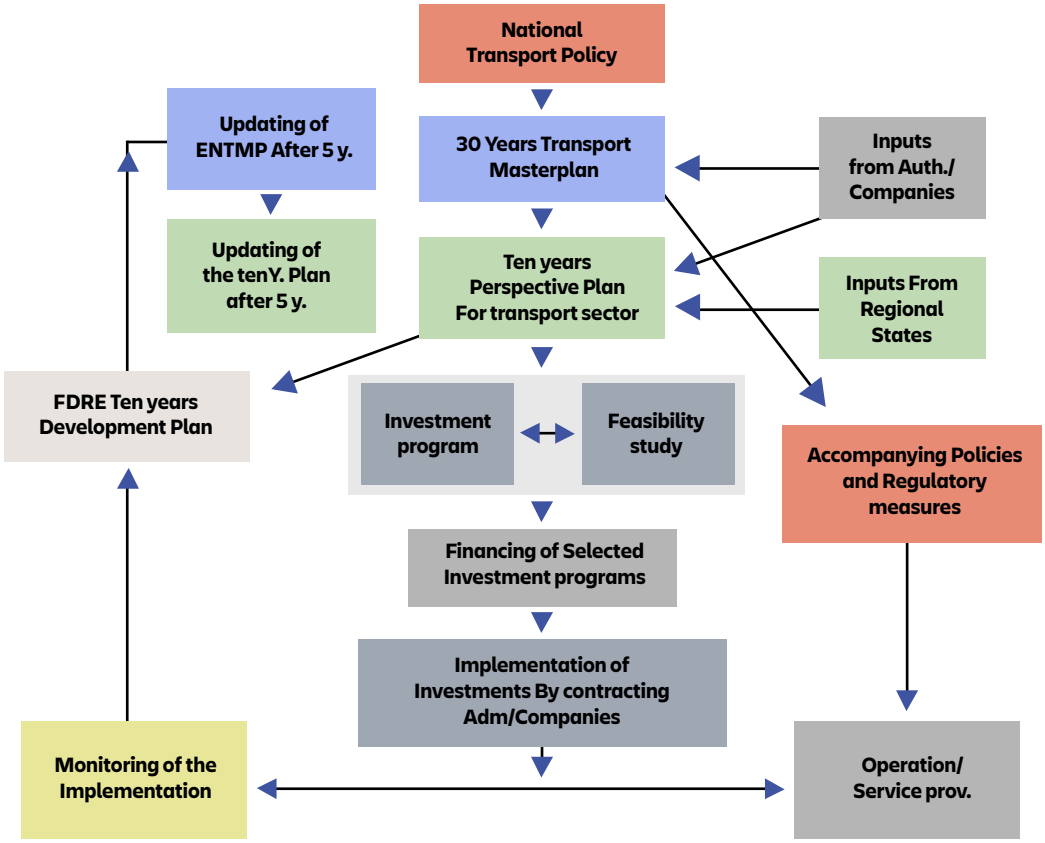
The four streams of activities that will be necessary to coordinate and to put in a correct phasing are:

1. the Masterplan governance;
2. the investments programs implementation cycle;
3. the accompanying policies and regulatory measures;
4. the capacity building activities.

THE MASTERPLAN GOVERNANCE

From now on, the process of Transport Planning and implementation In Ethiopia can be performed at a full standard:

- Delivered the Transport Policy, the 10 years Plan and the 30 years Masterplan:
- The masterplan process can be transformed from occasional to systematic
- The transport model (Transcad) is under installation
- Periodic Updating of the Masterplan and the 10 years plan
- Recommended period for the updating: every five years



Process of Planning and Implementation of Public Investments in the Transport Sector

THE INVESTMENTS PROGRAMS IMPLEMENTATION CYCLE

The critical issues are:

The importance of the feasibility studies: they play a vital role in transforming what is planned on paper into something that is actually achievable. All components of this fundamental tool, from technical standards definition to traffic study, from alignment definition to business case and cost-benefit analysis, must be accurately carried out.

The third party between detailed design and construction: a strict third-party approach should be followed, separating detailed design from construction phase. It is furthermore crucial to avoid unbalances between supervision and construction activities, through the separation of the two activities.

The timing coordination with the regulatory streaming: realization of new transport capacity and regulatory streaming are not independent but need to be coordinated. Policies implementation and measures' establishment take time just as infrastructures building does.

The impact of the new investments on FX: this issue has two sides: the impact of FX for the construction of the new infrastructures and the impact deriving from the private investments required for the use of that infrastructures. Both sides call for an active agenda of prioritisation for the manufacturing sector linked to the transport sector.

THE CAPACITY BUILDING : DIAGNOSIS

The capacity building must be considered a key strategic tool in all the transport sub sectors.

- Considerable amount of resources has been devoted during the last years for many capacity building, training and technical assistance initiatives in the sector.
- Overall, the transport sector has significantly benefited of the interventions and has grown in quality and number of professionals.
- The development of University programs specialized in the engineering of the specific modes of transport has supported the offer of educated personnel in the labor market. More efforts are required to train the young generations in subsectors as the Urban Mobility planning and the non motorized mobility.
- The relevant effort not always has brought corresponding results.
- The progresses are more evident in aviation, road administration and railways. In other sectors, where the role of private operators is dominant (freight transport, urban transport) the gap is huge.
- The capacity building programs that the MOTL is launching in the short run are even more challenging and relevant in terms of resources.
- Most of the initiatives come out bottom-up, and there is a clear gap in terms of unitary and organic program formulation as well as of coordination among the different initiatives.
- The lack of coordination implies loss of opportunities in term of synergies and with risk of overlapping and mutual erosion.
- A further gap is in terms of effectiveness of the intervention, for reasons either of intervention design or for poor implementation.
- There is no evidence of evaluation of the capacity building programs and there is no presence of an homogeneous measurement methodology.

Institutions	Gender		
	Male	Female	Total
MOTL	65.4%	34.6%	100.0%
FTA	65.9%	34.1%	100.0%
ECAA	80.4%	19.6%	100.0%
EMAA	63.9%	36.1%	100.0%
IFAA	55.3%	44.7%	100.0%
RFO	66.7%	33.3%	100.0%
ERC	62.9%	36.7%	100.0%
EDR	63.5%	36.5%	100.0%
ERA	80.0%	20.0%	100.0%
ETRE	59.0%	41.0%	100.0%
PSTSE	85.9%	14.1%	100.0%
EAL	60.8%	39.2%	100.0%
ESLSE	77.3%	22.8%	100.0%
G/Total	70.8%	29.2%	100.0%

Federal Transport Institutions / Enterprises by Gender (%)

THE CAPACITY BUILDING : THE INTERVENTION LINES

It has been designed a Capacity Building Management System (CBMS), that is built on four pillars:

1. the Organization redesign of the capacity building/ human resources development unit in MOTL, in the Authorities/companies under it and the creation of ad hoc Committees.
2. Coordination procedures between MOTL and the Authorities/Companies of the sector.
3. an Evaluation Methodology for the measurement of the effectiveness of each capacity building/ training intervention on a homogeneous base.
4. an Implementation Strategy.

TRANSPORT INTEGRATION

The ETMP 2050 is considering

1. **horizontal integration,** like transport-spatial development integration, rural-urban integration and regional integration with neighbouring countries and transit ports and vertical integration, like integration between different modes of transport, both for passengers and freight transport.
2. **Vertical modal integration** as considered inside the ETMP transport model, inserting intermodal passenger and freight terminal between the different modes considered
3. **The regional integration** takes into consideration the Ethiopia increase of regional and overseas trade that will ask for an organized, effective and competitive logistic system, modern and well-managed truck industry and efficient rail transport infrastructure, to access diversified ocean orts and neighbouring nations.

HORIZONTAL INTEGRATION

The transport system has to accompany and support the desired social and economic development of the country (transport-spatial development integration), according with the declared national objectives and different sector planning instruments. The economic, social, spatial, trade, agricultural, industrial, tourism, mining development in Ethiopia, will create passenger and freight transport demand growth and diversification, that has to be accommodated by adequate, efficient and safe transport offer in terms of infrastructure, services and vehicles.

In the next 30 years, the desired increase of per-capita income, together with the expected demographic increase will ask for an improved urban mobility system and an organized extra-urban public transport service.

Rural areas development will need a more capillary all-weather rural roads to facilitate transport accessibility and rural-urban integration. The new spatial corridor developments, including industrial and agro-industrial parks, will involve a substantial increase of passengers and freight transport demand and should be satisfied with modern and mass transport, like expressways and railway links. The increase of regional and overseas trade will ask for an organized, effective and competitive logistic system, modern and well-managed truck industry and efficient infrastructures, using diversified trade corridors to different transit ports (regional integration).

Increased tourism demand, especially from abroad visitors, will ask for air and road capillary accessibility and comfortable local transport including inland waterways. Mining sector development will ask for specific road accessibility and, in case of large quantities of products, for railway link. The spatial-transport integration in the ETMP50 is obtained serving appropriately the different spatial development corridors identified in paragraph 4.9, where, according with the different scenarios and the assignments of the transport model, a modern capable infrastructure is assigned (railway or expressway).

VERTICAL INTEGRATION

The ETMP50 creates an integrated transport system, for passenger and freight, using the most appropriate, efficient and effective multimodal/intermodal connections, avoiding duplications of offer but ensuring free market access to different transport operators for each mode at the same time. The integration of transport modes is to be applied at national and local level.

Intermodal passenger transport uses two or more modes of transportation in a journey in order to combine the strengths (and offset the weaknesses) of various transportation options. A major goal of modern intermodal passenger transport is to reduce dependence on the automobile as the major mode of ground transportation and increase use of public transport. In urban transport, automobiles or taxis are conventionally used as a single-mode form of transit, but they also find use in a variety of mixed-mode scenarios, like to provide a short commute to bus stations, train stations, airports, where all-day "park and ride" lots are often available.

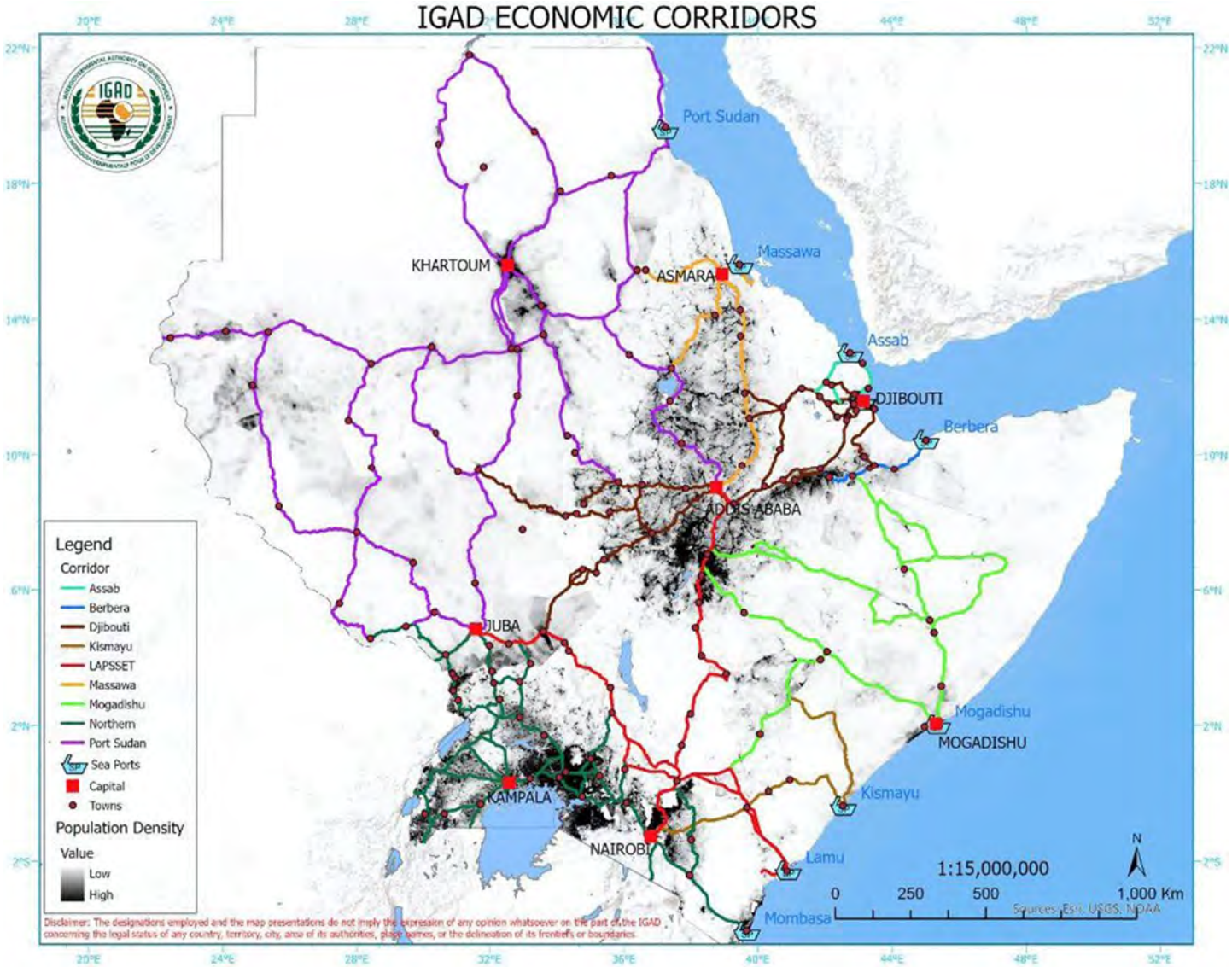
Intermodal/multimodal freight transport (in logistics and inland distribution) involves the transportation of freight in an intermodal unit (container) or vehicle, using multiple modes of transportation (e.g., ship, rail, truck, ferry), without any handling of the freight itself when changing modes. The method reduces cargo handling, and so improves security, reduces damage and loss, and allows freight to be transported faster. Reduced costs over road trucking is the key benefit for inter-continental use. This may be offset by reduced timings for road transport over shorter distances. Crucial importance is assumed by the freight intermodal terminals, a location for the transfer of freight from one transport mode to another, for example transshipment terminals from between road - rail, ports, airports

REGIONAL INTEGRATION

The ETMP50 should be harmonised with the wider regional development plans, in order to connect Ethiopian spatial development corridors and trade corridors with the regional or neighbouring countries infrastructure development plans. COMESA, Africa Agenda 2063, One-Belt Initiative and Trans-Africa Highways are initiative that are expected to ensure smooth movement of goods and people and are therefore considered in the master plan.

Inside the Agenda 2063 flagship projects, the establishment of the African Continental Free Trade Area (AfCFTA) is a very important step taken by the 18th ordinary Session of Assembly of Heads of State and Government, held in Addis Ababa in January 2012. The AfCFTA aims at accelerating intra-African trade and boosting Africa's trading position in the global market by strengthening Africa's common voice and policy space in global trade negotiations. As at 5 February 2021, 36 countries have deposited their instruments of ratification., 36 countries have ratified the AfCFTA agreement.

Regional integration between the IGAD countries has been proposed by the recent Regional Infrastructure Master Plan (IRIMP) forecasting Transport, ICT, Energy and Transboundary Water Resources infrastructure in the region:


IGAD ECONOMIC CORRIDORS
Port Sudan
KHARTOUM
ASMARA
Massawa
Assab
DJIBOUTI
Berbera
ADDIS ABABA
JUBA
KAMPALA
NAIROBI
Mogadishu
MOGADISHU
Kismayu
Lamu
Mombasa
Legend
Corridor
Assab
Berbera
Djibouti
Kismayu
LAPSSET
Massawa
Mogadishu
Northern
Port Sudan
Sea Ports
Capital
Towns
Population Density
Value
Low
High
1:15,000,000
0 250 500 1,000 Km
N
Sources: Esri, USGS, NOAA
Disclaimer: The designations employed and the map presentations do not imply the expression of any opinion whatsoever on the part of the IGAD concerning the legal status of any country, territory, city, area of its authorities, place names, or the delineation of its frontiers or boundaries.

TRANSPORT INNOVATION

PLANNING PROCESS INNOVATION

The correct planning process for infrastructure investments, especially in the Consultant **Training** in the road sector should take advantage of:

- Installation and use of the Transport Master Plan TransCad Model
- use of HDM4 for road project, programming and strategy plans;
- use of a MultiCriteria model to be used for prioritization of transport projects.

Capacity Building activities should be developed, regarding:

- Developing an efficient Road Asset Management System and interface with HDM4;
- Application of Performance Based Contracts for road maintenance;
- Use of mobile Big Data for traffic assessment and planning;
- Establish an office for research on international developing innovations, like use of IT, green fuel, autonomous vehicles, etc.

DIGITAL TRANSPORT INNOVATION

The Ethiopia Ministry of Innovation and Technology has recently prepared, with UNCTAD assistance, a Science, Technology and Innovation Policy Document, in order to create innovation systems in the country, implementing the Sustainable Development Goals (SDGs) and develop the export-oriented and manufacturing sector-based industrialization strategy.

Moreover, the Digital Ethiopia 2025 – A strategy for Ethiopia inclusive prosperity, aims to connect Ethiopia to the world global transformation driven by new technologies such as: Artificial Intelligence, Internet of Things, Nanotechnology, and Big Data, amongst many others that offer new models for production, communication, and lifestyle. For Ethiopia, a digital transformation strategy needs to be aligned with critical Homegrown documents i.e., the 2019 Homegrown Economic Reform Agenda and the T e n -Year Development Plan (2020-2030) as well as with international commitments such as the Sustainable Development Goals and the African Union's Continental Digital Strategy.

MOBILITY ICT INNOVATION

The ETMP 2050 is the right chance to make the **transport system sustainable** in terms of environment, safety, adapt to climate change, maintainable and congruent with transport demand, avoiding over-offering of transport infrastructure/services. It is also the chance to introduce innovative themes in **transport planning,** administration, management and operation, using the most appropriate and effective tools and IT systems. In terms of transport planning, a holistic approach is suggested, coordinating the different vertical levels: national, regional, woreda and municipal levels and including the different modes of transport. In terms of administration, the use of transport demand management to reduce vehicular traffic and encourage the use of public and non-motorized transport, with the adoption of SUMPs - **Sustainable Urban Mobility Plans and smart city concepts** for Ethiopia cities and with the development of integrated rapid public transport network plans and transit-orientated developments (TOD) in development corridors. In terms of **transport technology,** Ethiopia should introduce different modes of transport of passengers (cable cars) where technically and economically justified, pipeline transport for the import of fuel liquid or gas and take advantages of the Internet of Things (IoT) in all transport modes and follow the futuribles innovations in terms of autonomous vehicles, hydrogen vehicles, advanced driver assistance for reduction of accidents, e-vehicles, low cabon emission, e-logistics, aviation simulations, drones, urban mobility on demand, smart cities etc.

Layout and Infographics
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MINISTRY OF TRANSPORT AND LOGISTICS