Mobilise Your City

# SUSTAINABLE URBAN MOBILITY PLAN OF DIRE DAWA

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## Context of the Publication

This publication has been developed within the MobiliseYourCity (MYC) Partnership in collaboration with the projects EUROCLIMA+, funded by the European Union and "Advancing climate strategies in rapidly motorising countries (TRANSfer)", funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

The EUROCLIMA+ programme promotes environmentally sustainable and climate-resilient development in 18 Latin American countries through regional policy dialogue and climate action in six sectors. In urban mobility, EUROCLIMA+ supports the development of National Urban Mobility Policies and Programmes (NUMP), Sustainable Urban Mobility Plans (SUMP) and pilot projects through 19 projects in 14 partner countries and cities. A specific focus of EUROCLIMA+ is support the implementation of NDCs which Latin American countries have committed themselves to in the context of the 2015 Paris Climate Agreement.

MobiliseYourCity is a partnership for integrated urban development planning in emerging and developing countries under the UN Marrakesh Partnership for Global Climate Action. MobiliseYourCity supports and engages local and national partner governments in improving urban mobility planning & finance by providing a methodological framework and technical assistance, through capacity building, and by enabling access to funding at both local and national levels. Particular attention has been paid to the methodological and advisory frameworks related to National Urban Mobility Policies and/or Programs (NUMPs) and Sustainable Urban Mobility Plans (SUMPs) that serve as the basis for the promotion of investments and development of attractive mobility services.

MobiliseYourCity is a multi-donor action, jointly co-financed by the European Commission's Directorate-General for International Cooperation and Development (DG DEVCO), the French Ministry of Ecological Transition and Solidarity (MTES), the French Facility for Global Environment (FFEM), and the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The initiative is implemented by its founding partners ADEME, AFD, CEREMA, CODATU, and GIZ. Besides contribution to the international climate process, MobiliseYourCity contributes to the UN's Agenda 2030, specifically Sustainable Development Goal (SDG) 11: Make cities inclusive, safe, resilient and sustainable. The objectives of which are to:

- Enable transformational changes towards more inclusive, liveable, and efficient cities.
- Foster more comprehensive, integrated and participatory urban mobility planning (local & national levels).
- Target reduction of transport related GHG emissions in participating cities (>50% until 2050).
- Link planning with agreement on investments and optional use of financial assistance.
- Make use of innovative planning techniques and digitalization and promote state-of-the-art mobility and transport technologies.

# Contents

# Foreword

The SUMP of Dire Dawa is a much-welcomed achievement for the city. It draws the future shape of its mobility for the next twenty years and defines a set practical actions as well as a step by step approach for its implementation.

It has been prepared over a period of more than two years from December 2019 to March 2020, braving different COVID lockdowns to come to its end.

It has relied on a large stakeholder engagement carried out through different formats, from one-to-one interviews to focus groups and technical workshops. Six stakeholder engagement milestones have been met, all matching with the main steps of the elaboration of the SUMP: inception, diagnosis, vision and scenarios, objectives, action plan, implementation conditions.

Extensive field work has also been carried out to have a clear practical understanding of mobility conditions in all the Kebeles of the city, leaving no district aside and proposing solutions for all identified issues.

The Dire Dawa City administration and the Federal administration have worked in close collaboration with the consultant commissioned by AFD (Systra) to define the content of the SUMP and make it a shared reference planning document for the development of sustainable mobility. Along with the Structural plan that cares for urban planning, the SUMP supports a bold development strategy integrating sustainable mobility and urban growth.

SUMP implementation will support a wide array of projects, from road infrastructure network improvement to the development of public transport services and non-motorised transports.

The SUMP will also be a base of discussion to gather the resources needed for its implementation with the Federal level as well as with International Financial Institutions.

# 1. Executive summary

## 1.1. Background of the SUMP

Dire Dawa was created as a railway boom city in the early 20th century and has been growing ever since. It stands out as a commercial hub at national and regional level thanks to its position between Addis and Djibouti, its influence over a wide regional hinterland and its own production basis. This hub position has been diversified and renewed, especially with the new railway line substituting to the old one and full road connectivity soon to be achieved.

The city road network is rather well developed and covers most of the urban area. However, the main roads make a rather loose network limited to a few main axes not so well connected while local roads account for most of the network though having little capacities to bear mobility flows. Mobility along the main road axes is commonly affected by different types of road layout, congested crossroads and conflicting uses for the road and its immediate vicinity, whether between different transit uses (e.g., Bajaj parking area vs traffic) or between transit and street side business. Such situations can be found at Seido crossroad and market, at Ashawa wade or Connel. As a consequence, effective road capacity falls much beyond its notional capacity.

With about 8 000 units and 260 000 trips a day, Bajaj represent most of the public transport supply in Dire Dawa. However, they are privately operated with little public regulation and no subsidy. Service is then strictly proportioned to profit and presents different flaws. It is focused on main mobility needs, whether in time (week base days, peak hours) or in space (main axes, main origin-destination pairs). Conversely, other needs and residual demand are poorly or not considered at all, leaving large chunks of demand unaddressed. Fare levels remain affordable for core demand but quickly get higher and much less affordable outside it.

While being the first transport mode in Dire Dawa with a modal share of 46%, walking is an “invisible mode”. Infrastructures sometimes care for pedestrian mobility but neither systematically nor in a continuous manner. Due to lack of clear routes, pedestrians often end up on the road, melting in the overall traffic, which raises safety and traffic management issue.

Mass transit is not currently an issue for passenger transport in Dire Dawa as the micro transit supply carried out by Bajaj copes with demand. Switching abruptly from a small size supply to mass one would not make sense regarding demand level or economic balance. Structuring, transforming and developing the current services seems a fairer option for the short and medium term.

However, the city is now potentially at the early stage of a new step of its development with a scale of development that could radically change in the coming years. Strong urban population growth prospects can be contemplated as the city is building over a renewed and reinforced position at national level. The Federal Government intends to make Dire Dawa the eastern economic hub of the country, counting with 12 000 hectares newly urbanized to develop the so-called “New Industrial Park”. The City Administration also contemplates extensive urban developments meant to deconcentrate Dire Dawa population from the historical center and prevent further densification related to rural migrations.

These perspectives are likely to increase trips number and distance and may well push up this micro transit system against its limits, adding to congestion, pollution, and unsafe operating conditions. While the population is prone to walk, the situation could change if car ownership increases. Indeed, the private car remains a symbol of wealth, freedom. It is also a more comfortable and reliable option compared to Bajaj.

In this context, it is of high importance to channel and coordinate the city development to prevent the negative externalities that could stem out of an uncontrolled development and anchor this development on the existing assets of the city instead. Up to now, the rather compact and centre-focused development of the city has stimulated rather sustainable behaviours and mobility patterns ("grid" structure, large tendency to walk) which should be considered as a positive asset. However, some risks are looming with new projects possibly favouring urban sprawl and an economic prosperity coupled with a relatively high spending power possibly favouring the increase of car ownership and pushing the city toward a car-oriented pattern.

## 1.2. Objective and scope

The general objectives of the SUMP are summarized below:

- Set a **strategic vision** for transports in Dire Dawa, based on a precise overview of mobility in the city,
- Define and propose **hierarchized strategic principles** as well as **prioritised actions and measures** as part of a pragmatic strategy addressing the mobility needs while favouring as much as possible sustainable modes of transport,
- Build and share a **common vision of the urban mobility policy**, hand in hand with local stakeholders,
- Develop the means to **promote sustainable and carbon-low mobility** by setting the conditions for balanced modal split,
- Make sure to **balance investment and management measures** to guarantee sustainable actions,
- **Articulate mobility with urban planning** and urban development to build an optimized mobility system that connects everyone in the city and its activities in a fair and sustainable way,
- Integrate mobility in the city to make it safe and smooth so as to increase safety and improve liveability,
- Propose an **inclusive vision of mobility** by taking into account the social, gender, cultural and geographic dimensions,
- Address the practical evolutions of mobility and **promote technological innovations** that can strengthen them.

## 1.3. Methodology

The global approach for the SUMP elaboration considers 4 steps:

- **The kick-off or inception phase** enables to fine tune the methodology jointly with local counterparts. Especially, it aims at engaging with key stakeholders and conduct a stakeholder mapping, set up the project management framework, consolidate the work plan and data collection methods, and launch the data collection program.
- **The mobility diagnosis**, meant to achieve a shared understanding of the challenges, strengths and weaknesses of the mobility in Dire Dawa.
- **The formulation of the vision and objectives of the SUMP**, representing the strategical framework to the plan. It relies on the participative construction of development scenarios and associated measures, that are later assessed and compared to define the most desirable future for the City.
- **The derivation of the action and financing plan**, including a detailed description of measures and projects to improve mobility and accessibility, an evaluation of priorities and categorization of actions in the short, medium and long term, cost estimates, funding sources and mechanisms, as well as implementation conditions and schedule. It figures the operational road map to guide the local authorities during the implementation phase of the SUMP.

This process is supported by cross-cutting activities, including a large participatory process, that target all mobility stakeholders, as well as the civil society. Related objectives are to:

- Encourage the participation and contributions of citizens, as a way to communicate and inform about the global initiative but also to tailor the SUMP to local needs and expectations.
- Ensure the commitment and ownership of mobility stakeholders, in order to ensure political endorsement, as well as general acceptance and legitimacy of the final document.
- Set up working structures that could later support the implementation of the SUMP, thus favoring the dialogue and coordination between stakeholders.

## 1.4. Document structure

The present report is the final deliverable of the SUMP development process. It summarizes the activities carried out, from the diagnostic to the action and financing plan, thus keeping track of the considerations that have led to the emergence and formulation of the SUMP. It also documents the process itself, as well as recommended modalities for implementation, monitoring and reporting.

The structure is as follow:

- Process and management structure
- Status quo analysis
- Vision and objectives
- Selected scenario and actions
- Monitoring and reporting

Technical features of the SUMP figure in appendix, including:

- Data collection method
- Participation summary
- Description of scenarios
- Traffic model report
- Data reporting template for monitoring and evaluation

## 1.5. Key results

The SUMP has provided valuable products and tools, that not only shed light on mobility conditions and issues in Dire Dawa, but also represent assets, meant to strengthen capacities of local authorities in mobility planning and management. In particular:

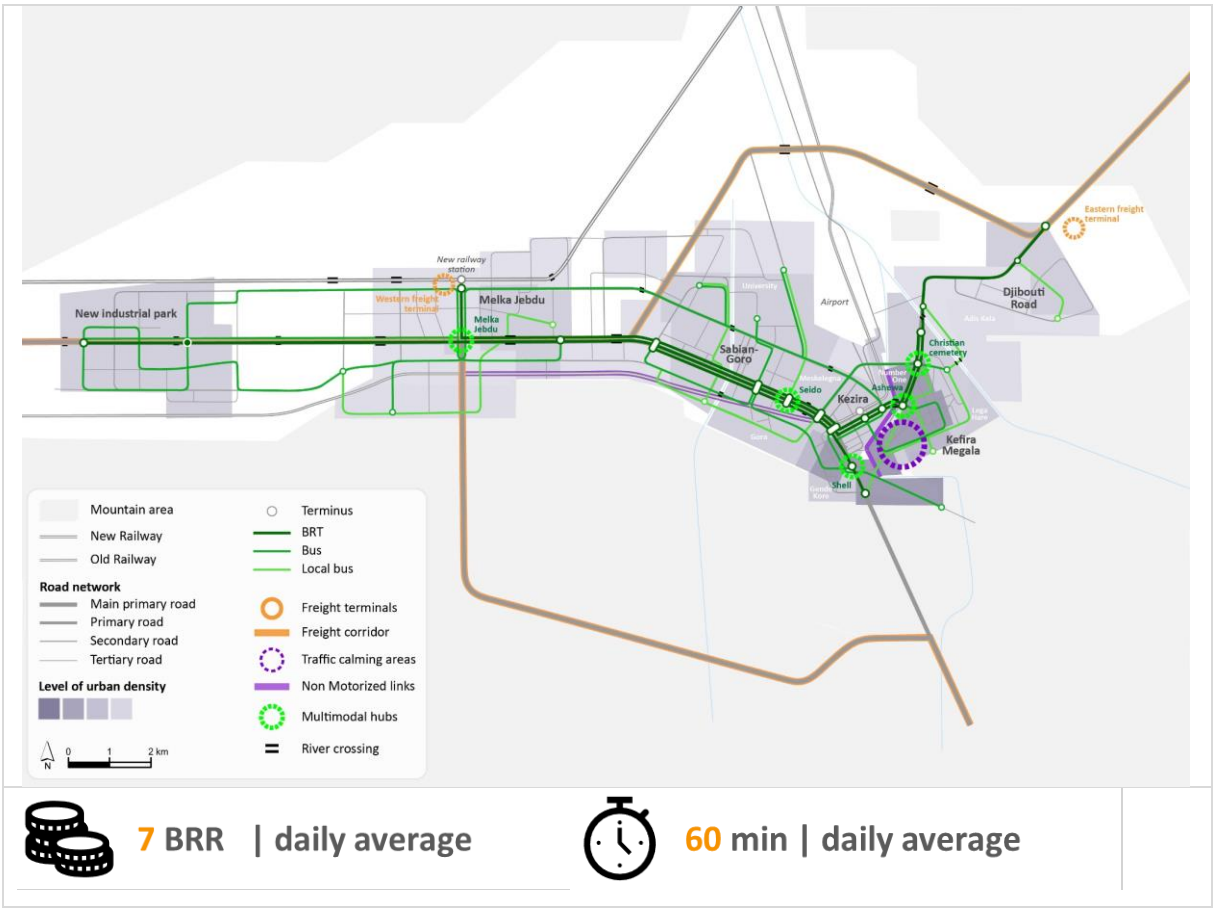
- **A household survey of 1 036 households was completed**, that is representative of the urban population. It is the most detailed and comprehensive data source on urban mobility. It highlighted important facts on mobility, such as the preponderant position of walking among the transport modes (46% of daily trips), a relatively high propension to move (1.8 daily trips per inhabitants), but also the fact that part of the demand is refrained, as the availability and price of public transport tend to limit the mobility, according to distance.
- **Technical personnel from local and federal institutions were trained to demand modelling**. While delivering the four-steps demand forecast model (Quetzal), a training on modelling has been proposed to technical specialists from the Project Office with skills in transport planning, GIS or programming. The training included a methodological approach of transport modelling and a demonstration of the use of Dire Dawa demand forecast model.

More generally, the SUMP has established a comprehensive diagnosis of the mobility, that is shared among local stakeholders, and set the basis for the SUMP evaluation. In particular, eight main issues have been highlighted.


### Dire Dawa mobility issues

The SUMP has also led mobility stakeholders to agree upon an integrated and sustainable, long term mobility vision for Dire Dawa. It addresses local mobility issues, while pursuing sustainable development goals:

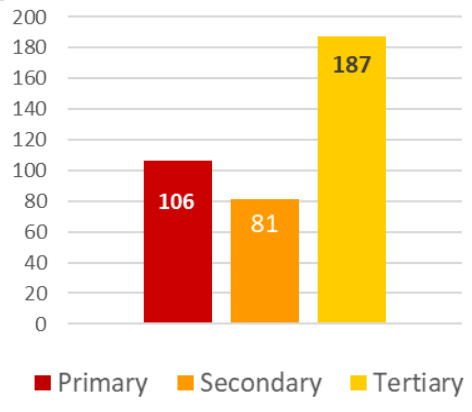
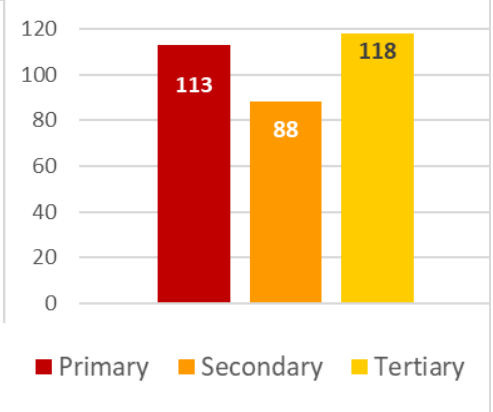
- **It represents a 40% cut in GHG emissions by 2040, when compared to the "business-as-usual" scenarios**, thus figuring a significant shift, as well as a major improvement of environmental and health impacts.
- **It proposes a mobility system that is affordable and inclusive**, relying on a publicly regulated service. Transport coverage and quality of service would significantly improve, while mobility expenses would not exceed about 10% of the monthly household income.
- **It aims at a fair development**, combining economic development and harmonious coexistence of local communities thanks to a compact and polycentric urban pattern.

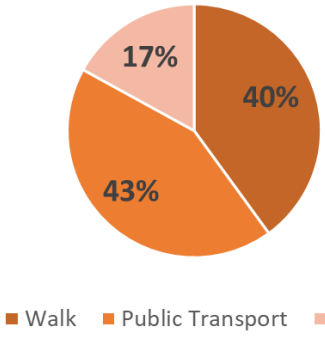
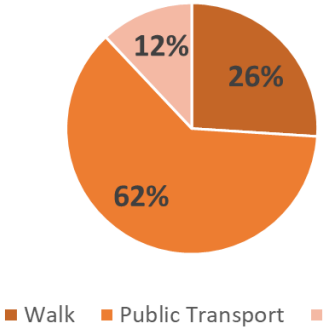
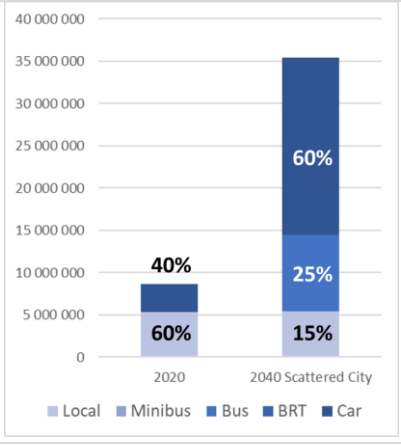
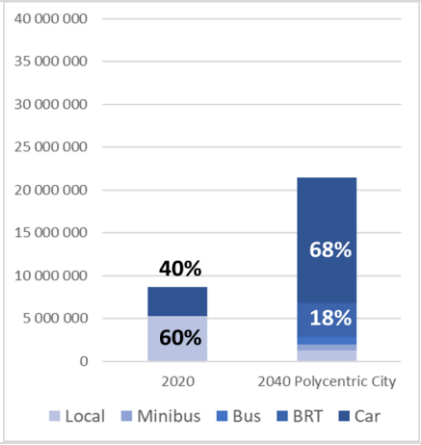



**Dire Dawa mobility vision 2040**

The table below compares the Dire Dawa mobility vision with the business-as-usual scenario, which is marked by a sparse and scarce urban pattern, that does not allow any massification of services supply. In that scenario, micro paratransit remains predominant over the Greater Dire Dawa with some issues regarding quality of service, social inclusion, safety, etc.

**Comparison of Dire Dawa mobility vision against the business-as-usual scenario**

| | Business as usual scenario | Dire Dawa mobility vision |
|---|---|---|
| INFRA-STRUCTURE NETWORK |  |  |

| | | |
|---|---|---|
| | ▪ **Primary road : 106 km / + 25 km / 12%**<br>▪ **Secondary road : 81 km / + 63 km / 9%**<br>▪ **Tertiary road : 187 km / + 169 km / 20%** | ▪ **Primary road : 113 km / + 32 km / 14%**<br>▪ **Secondary road : 88 km / + 70 km / 11%**<br>▪ **Tertiary road : 118 km / + 100 km / 14%** |
| MOBILITY SYSTEM |  |  |
| | ▪ BRT : 0 km / 0 boardings<br>▪ **Bus : 44 km / 423 000 daily boardings**<br>▪ **Micro transit : 62 km / 375 000 daily boardings** | ▪ **BRT : 29 km / 473 000 boardings**<br>▪ **Bus : 53 km / 415 000 daily boardings**<br>▪ **Micro transit : 27 km / 178 000 daily boardings** |
| GOVERN-ANCE | ▪ Dual administration (local and federal governments)<br>▪ Mobility governance: business as usual<br>▪ Loose coordination between urban and mobility policies<br>▪ SUMP implementation at risk | ▪ Integrated administration (one local government)<br>▪ Mixed commission as a metropolitan PTA<br>▪ Tight coordination of urban and transport policies at local level<br>▪ SUMP implementation is optimal |
| CARBON FOOTPRINT |  |  |
| | ▪ Annual emissions: 35 400 tCO2eq<br>▪ Annual emissions per inhab.: 47 CO2eq (+ 73%)<br>▪ GHG emissions cut compared to BAU scenario : 0% | ▪ Annual emissions: 21 500 tCO2eq<br>▪ Annual emissions per inhab.: 28 CO2eq (+ 5%)<br>▪ GHG emissions cut compared to BAU scenario : -40% |

## 1.6. Conclusions and recommendations

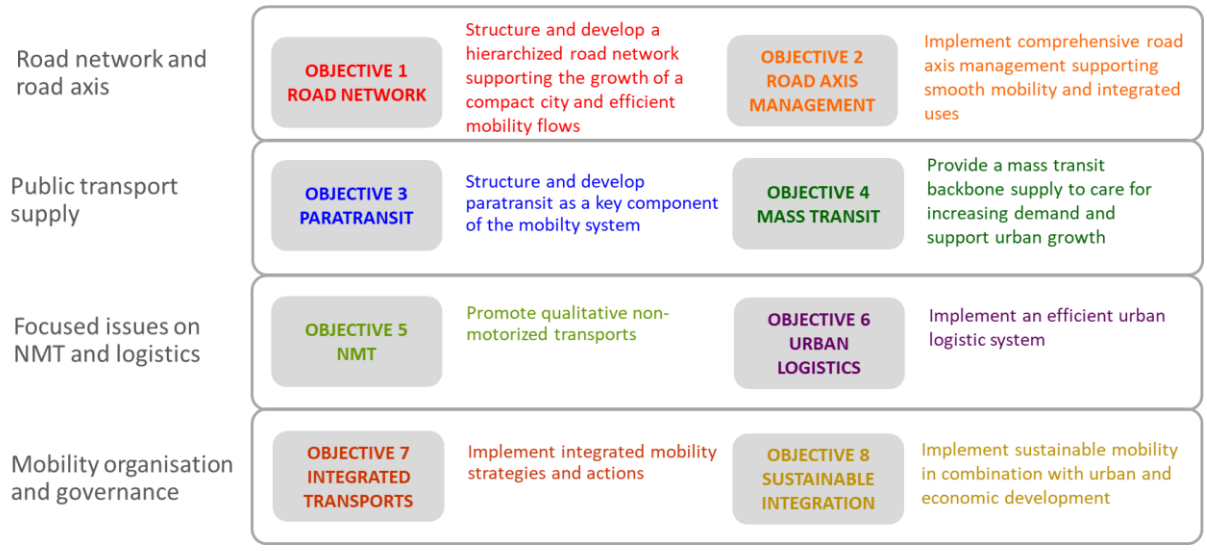
### 1.6.1. A strategic vision for the long term

The overall vision for the future of mobility in the city of Dire Dawa can be summed as to « **Make Dire Dawa a polycentric, inclusive, compact and mobility-wise city** ». Four ambitions based on sustainable development principles are formulated from a mobility perspective and are fully embedded in the specific Dire Dawa context. These ambitions are to:

- Develop a mobility system fully articulated to a high-quality urban growth. this ambition cares for an efficient territorial integration of the city as a key factor for an efficient mobility system;
- Build up a connected and integrated city caring for the needs of all citizens and districts. This ambition cares for an inclusive mobility, both on social and territorial grounds;
- Develop mobility through carbon-wise solutions. This ambition cares for environmental and climate wise mobility;
- Implement an efficient mobility system supporting Dire Dawa as an attractive economic hub inserted in global flows. This ambition cares to support the economic growth of Dire Dawa.

Eight objectives gathered in four groups embody the ambitions of the SUMP and cover the whole scope of activities enabling to materialise them. These objectives allow to define both an articulate strategy covering all mobility aspects and a practical frame for an operational roadmap allowing to implement it. All mobility actions stemming out of the SUMP are therefore related to these objectives and can be put in a bigger strategic picture, giving thus their full meaning and allowing to understand their relations and interfaces. This bigger picture supports both politic and operational level to give practical content to the strategies and to put actions in a broader strategic perspective.

This set of practical and operational objectives therefore intends to give a strategic compass to refer to when coming to action and – further on- to their evaluation.




SUMP objectives

## 1.6.2. An operational action plan to implement the vision

The SUMP action plan has been elaborated according to the SUMP objectives and considering six types of actions that cover all potential interventions to be carried out, from projects to awareness raising. Thus, all objectives are addressed in all relevant ways.

| | |
|---|---|
| **TYPE A OPERATIONAL PROJECTS** | «Hardware» investments in mobility an transports<br>*e.g. road upgrade, BRT network, bus network, etc.* |
| **TYPE B PROCESS & GUIDELINES** | Design guidelines/standards for relevant and coherent projects. Organisation processes for project implementation<br>*e.g. road design guidelines, TOD handbook, etc.* |
| **TYPE C POLICIES & STRATEGIES** | Policies and strategies to scope and prioritize mobility projects<br>*e.g. Road Plan, Circulation plan, urban logistics plan* |
| **TYPE D GOVERNANCE & FINANCE** | Distribution and articulation of competences between stakeholders Decision and financing processes<br>*e.g. Transport Authority* |
| **TYPE E INTELLIGENCE & CAPACITIES** | Knowledge management : training, capitalisation, networking, tools (databases, software, etc.)<br>*e.g. sustainable mobility projects management training* |
| **TYPE F AWARENESS & EMPOWERMENT** | Citizen and civil society awareness raising and empowerment<br>*e.g. walking in Dire Dawa, Cycling in Dire Dawa* |

### Type of actions

The resulting action matrix has been shared with SUMP stakeholders in the early steps of action setting in order to discuss their remarks and support their adhesion to the process. The matrix will be kept during SUMP implementation as a clear and practical compass that allows to understand how each action fits in the global picture and the other way round how objectives are duly addressed by according actions. It is also a simple tool to be used to update the SUMP by adding, gathering or deleting some actions.

| *SUMP ACTION TYPES* | | | TYPE A | TYPE B | TYPE C | TYPE D | TYPE E | TYPE F |
|---|---|---|---|---|---|---|---|---|
| *SUMP OBJECTIVES* | | | OPERATIONAL PROJECTS | PROCESS & GUIDELINES | POLICIES & STRATEGIES | GOVERNANCE & FINANCE | INTELLIGENCE & CAPACITIES | AWARENESS &EMPOWERMENT |
| OBJ. 1 | road network | *Structure and develop a hierarchised road network supporting efficient mobility flows and the growth of a compact city* | 1A1 main road projects<br>1A2 micro road projects | 1B1 road design guidelines<br>1B2 Road maintenance plan | 1C1 Target road and crossroad network | *cf. Integrated transport* | *cf. Integrated transport* | |
| OBJ. 2 | road axis management | *Implement comprehensive road axis management supporting fluid mobility and integrated uses* | 2A1 Road axis upgrade projects | 2B1 Traffic and mobility management | 2C1 Circulation plan | 2D1 Traffic management unit | *cf. Integrated transport* | |
| OBJ. 3 | para transit | *Structure and develop paratransit as a component of the mobilty system* | 3A1 Paratransit structuration and development | 3B1 Quality of service targets | 3C1 Paratransit Transition Plan | *cf. Integrated transport* | 3E1 Paratransit sector capacity reinforcement | |
| OBJ. 4 | mass transit | *Provide a mass transit backbone supply to care for increasing demand and support polycentric urban growth* | 4A1 Bus network development<br>4A2 BRT development | | 4C1 Mass transit development plan | 4D1 Fare integration | | |
| OBJ. 5 | NMT | *Confort and promote non-motorized transports* | 5A1 NMT projects<br>5A2 Bikes for all | 5B1 NMT integration in transport and mobility projects | 5C1 NMT development plan | *cf. Integrated transport* | 5E1 Pedestrian centred approach | 5F1 Walking in Dire Dawa |
| OBJ. 6 | urban logistics | *Set up an efficient urban logistic system* | 6A1 Freight terminal<br>6A2 Urban logistics projects | | 6C1 Urban logistics development plan | 6D1 Urban logistic manager | *cf. Integrated transport* | |
| OBJ. 7 | integrated transport | *Integrate transport and mobility strategies and actions* | 7A1 Transport hubs | 7B1 sustainable mobility planning process<br>7B2 mobility data management<br>7B3 SUMP evaluation | 7C1 Multimodal strategy<br>7C2 Energy wise mobility<br>7C3 Demand management | 7D1 Transport Authority<br>7D2 Integrated mobility financing | 7E1 Sustainable mobility project management<br>7E2 Inclusive, green and gender aware mobilty | 7F1 Inclusive,green and gender aware mobilty |
| OBJ. 8 | sustainable integration | *Integrate sustainable mobility with urban and economic development* | 8A1 TOD projects opportunities | 8B1 TOD guidelines | 8C1 TOD development plan | | | |

### SUMP actions matrix

The budget of the SUMP represents a total investment of 373 012 531 EUR. In that regard, it is worth mentioning that:

- **98%** of the SUMP budget corresponds to operational projects / CAPEX.

- **52%** of the SUMP budget is spent in the midterm, when the BRT is introduced. Thus; the financial plan is built so that the City has 7 years to consolidate its financial resources, improving revenue collection and liaising with IFIs.
- **18%** (about 69 MEUR) of the SUMP budget are related to the New Industrial Park internal infrastructures and services

### 1.6.3. Specific recommandations for implementation

#### Governance

The implementation of the SUMP relies on two distinct bodies:

- An institutional body, the Transport Authority, competent for transport and mobility topic over the whole metropolitan area of Dire Dawa, meaning the current City area but possibly in the future an increased area encompassing the New Industrial Park.
- A technical body, the SUMP taskforce, competent for the SUMP implementation, follow-up, and evaluation, under the authority of the integrated mobility authority. It is in charge of the examination of the SUMP projects, although with no power of decision.

A particular attention shall be paid to the establishment of the transport authority, that is meant to associates all authorities currently competent in the field of transport, namely the City of Dire Dawa City, the Federal Transport Authority (FTA) and the Ethiopian Road Authority (ERA). A progressive and pragmatic approach is recommended, considering at first the creation of a Mobility Committee. that brings the existing authorities together, under a commitment to manage transport and mobility related cases in a concerted and informed manner.

By the time a mass transit solution is contemplated, thus requiring capacities to contract with operators, to raise revenues and possibly give some subsidies, the Mobility Committee will eventually turn into a full fledge Transport Authority.

Overall, the challenge lies in the capacity to have an open discussion, speak a common language, welcome external point of views and accept to review the investment priorities of each member in that manner. To overcome technical barriers, it is recommended to organize in the very first years of implementation:

- SUMP dissemination activities, to favor awareness of the SUMP objectives and measures by members, as well as a strong political support of the SUMP from the Mayor and from federal level.
- Capacity building and workshops

#### Funding & financing

To formulate a robust financing strategy, two financing scenarios have been assessed:

- **A balanced scenario**, that proposes realistic conditions for the total coverage of the SUMP capital and operation expenditures. It uses the full potential of financing sources as previously exposed, excepted for the Road fund which is mobilized for a lesser share with a 4% annual growth rather than a 10% one. At the same time, it presents realistic share and volume from each contributor. Regarding IFI loans, the contribution is set considering a significant participation in public transports and NMT operational projects.
- **A conservative scenario**, meant to support the formulation of optimization measures under down-graded conditions. It assumes a lower growth of the City budget and of the IDA-the World Bank contributions over the SUMP programming period. A more limited amount from other FIs, including AFD, is also assumed, covering for 30% of the BRT development and 80% of the transport hubs reorganization. The federal Road Fund is raised to its maximum potential (10%) to compensate the underperformance of the City budget. Under the conditions of the conservative scenario, certain road projects must be discarded. Indeed, the financial balance is restored once 27 300 EUR are cut from road CAPEX, thus leading to save 22 600 EUR road OPEX over the SUMP lifecycle.

It is recommended to consider the conservative scenario as a baseline and take advantage of the preparation phase to consolidate the financing plan. In particular, the City should assess its capacity to improve revenue collection over the long term, on one hand, and liaise with IFIs on the other hand to refine the assumptions of the financing plan. It may allow to upgrade the financing plan accordingly.

| | City Administration | Federal Government | World Bank | Other IFIs | Private sector |
|---|---|---|---|---|---|
| Conservative scenario<br>Total contribution<br>517 MEUR | 208 MEUR | 82 MEUR (NIP)<br>8 MEUR (RF) | 53 MEUR | 50 MEUR | 14 MEUR |
| Assumptions | +2% per year (below population growth) | +10% per year (road fund) | +2% per year (below population growth) | 30% BRT project<br>80% PT hubs | |
| Balanced scenario<br>Total contribution<br>581 MEUR | 238 MEUR | 69 MEUR (NIP)<br>5 MEUR (RF) | 64 MEUR | 90 MEUR | 14 MEUR |
| Assumptions | +4% per year (along population growth) | +4% per year (road fund) | +4% per year (along population growth) | 50% BRT project<br>80% PT hubs<br>80% NMT projects | |

IFIs

### Financing assumptions considered

According to the financing plan, the City participation reaches 18% of the total revenues. As the city budget growth does not meet expectations, a higher share is allocated to recurrent expenses, thus limiting investment capacities to 38% of the annual budget.

## Monitoring & evaluation

The evaluation of the SUMP is essential to the success of the plan itself, as it enables to demonstrate the impact of the actions undertaken and therefore the efficiency of the SUMP in reaching its objectives. The regular measurement of indicators also allows to detect any exogenous phenomenon that could occur and impact SUMP implementation, and therefore to adapt the strategy accordingly.

As part of the top managment, the Evaluation & data manager is responsible for the SUMP evaluation, and more generally for the development of mobility data management processes. In practice, the SUMP monitoring and evaluation considers 2 levels:

- **General objectives of the SUMP**, that are related to macro indicators, based on the results of the 2020 household survey,
- **SUMP action results**, qualified by specific indicators, as detailed in the action sheets, that may require particular surveys, usually simpler than the household survey.

To succeed in its mission, the Evaluation & data manager should:

- Launch and maintain a collaborative dynamic between mobility stakeholders, through regular meetings to disseminate the SUMP evaluation principles and clarify derived requirements as for data production and exchange.
- Encourage capacity building, as needed, to ensure a common understanding of interfaces and the ability to fully support the SUMP implementation process.
- Value contributions as well as related outcomes, through public communication or presentation, which will tend to incentivize efficient collaboration with SUMP partners.

The SUMP provides a comprehensive evaluation guidance that is presented in appendix.

## Comunication and participation

The SUMP integrates a number of „awareness and empowerment“ actions, that target the general public but also the paratransit sector. For each objective, a pilot is identified and responsible for continuous communication along the implementation.

| OBJECTIVE short | ACTION TYPE | ACTION ID | ACTION NAME | COMMENT |
|---|---|---|---|---|
| para transit | Awareness & empowerment | 3.E.1 | Paratransit sector capacity reinforcement | Thanks to a large awareness raising operation involving transport suppliers that got labelled or massified<br>Offer as a benefit capacity building on topics such as eco-driving, analytic accounting |
| NMT | Awareness & empowerment | 5.E.1 | Pedestrian-centered approach | Develop pedestrian-centered approach, based on walkability/street rating system - identification of relevant data collection, method, process... |
| NMT | Awareness & empowerment | 5.F.1 | Walking in Dire Dawa | Foster the creation of a pedestrian asssociation that could share insights, be involved in technical reflexions about walking and bajaj drivers training...<br>Promote walking and cycling through special event such as "vehicle free day" (limited to denser areas)<br>Integrate cycling lessons in schools/propose cycling trainning & practice session, regular or punctual<br>Trainning session of bajaj drivers adressing careless behaviours toward pedestrians and focusing on safe driving, counting with the participation of pedestrians (prior to sanctions?)<br>Contemplate communication actions nation-wide in collaboration with MoT (in reference with NMT policy) |
| integrated transport | Awareness & empowerment | 7.F.1 | Inclusive, green and gender aware mobility | Raise public awareness on social and gender inclusion in urban mobility as well as on green urban mobility<br>Organise public events allowing to share policies, projects and actions on the topics<br>Support public participation to project consultations related to inclusion and environmental topics |

### Awareness and empowerment actions

Evaluation milestones also bring opportunities to communicate about the SUMP implementation, toward both stakeholders and the general public:

- As for action evaluation: punctual communication may be contemplated if relevant, according to the magnitude of the action. Relevant communication forms are press release, social network post, etc.
- As for the SUMP evaluation: evaluation results and outcomes shall be presented, highlighting the achievement of the SUMPs and lessons learned. In addition to web or press publication, public meeting, public exhibition or mobility fair may also be relevant, to reach a broader public.

Due to the collaborative nature of monitoring and evaluation processes, communication is important to raise awareness among stakeholders and ensure a good understanding of the nature and format of the information required. In some ways, it also supports the dissemination of the SUMP content among mobility stakeholders.

# 2. Process and management structure

## 2.1. Context of developing the SUMP

### 2.1.1. Background and general purpose of the SUMP

The Ethiopian context is characterized by a sustained urban population growth (4.8% in 2018). In the past, cities have grown in an organic manner. But low level of planning (both at the local and national levels) in a strong and fast urbanization context raises a number of issues. And like many other cities, Dire Dawa faces challenges related to urban mobility. These include challenges in terms of road safety, road congestion and air pollution, with sizeable impacts on the economy, public health as well as on the environment in general.

Walking is very present in Ethiopian cities, while motorized trips are mostly based on informal para-transit modes and share of public transport is low. In Dire Dawa, Bajaj represent most of the public transport supply. However, they are privately operated with little public regulation and no subsidy. Under these circumstances, the service is focused on core mobility needs, whereas the residual demand is poorly or not considered, fares quickly becoming unaffordable out of peak hours and main corridors. Besides, the limited capacity of Bajaj makes them relevant up to a certain point. Foreseen population growth and urban developments, that are likely to increase trips number and distance, may well push up this micro transit system against its limits, adding to congestion, pollution and unsafe operating conditions.

Indeed, substantial urban developments are considered, both at local and national level. In particular, a new industrial park is planned on the western edge of the city, with an ambitious program representing the equivalent of the current population of Dire Dawa. The city is thus potentially at the early stage of a new step of its development with a new railway line replacing the old one and full road connectivity to be soon achieved. Along with strong urban population growth prospects, the scale of its development could radically change in the coming years.

In this context, it is of high importance to channel and coordinate the city development in order to maximize its benefit and prevent the negative externalities that could stem out of it. Up to now, the rather compact and center-focused development of the city has stimulated rather sustainable behaviors and mobility patterns (“grid” structure, large tendency to walk) which should be considered as a positive asset. However, some risks are looming with new projects possibly favoring urban sprawl and an economic prosperity coupled with a relatively high spending power possibly favoring the increase of car ownership and pushing the city toward a car-oriented pattern.

### 2.1.2. Legal, regulatory and planning framework

The organization of the transport and mobility sector is currently split at several levels:

- **Between federal and local government**. Local government bears the responsibility of infrastructure investments but needs to find resources to finance them and depends on an insufficient Federal contribution for their maintenance. Some direct interventions have occurred by the Federal level in the local perimeter to implement projects of national interest (urban and infrastructure development on the new industrial zone). These interventions seem to match insufficiently with local planning and projects and risk to overburden already tight local maintenance capacities. Federal bodies also regulate urban transport services running in the city.
- **Between planning, implementation and operation.** Each activity is handled separately with limited feedback or overview of the whole system. This applies to institutional scheme, effective organization, as well as funding. Capital investment is neither connected with operation nor maintenance financing, which hamper the sustainability and efficiency of public action.
- **Between different transport infrastructures and services.** Mobility is not analysed nor conceived in a global, integrated approach as far as institutions are concerned though a number of civil servants are fully aware of the issue and have integrated rationale.

There is a long existing planning culture in Dire Dawa, with successive generations of urban masterplans in 1937, 1967, 1979, 1994 and 2006. Land use maps have supported the definition of urban policies getting as close as neighborhood level to promote a balanced development and efficient functioning of the city. The current 2006 Spatial Development Framework (SDF) is under revision to issue a new Urban Masterplan. No specific mobility planning document currently exists but an overall strategy defined in the Integrated Development Plan (IDP, 2006) features transport wise orientations, though not turning them into an action plan.

## 2.2. Process overview

### Time horizon of the SUMP

Prospective is an exercise that requires to limit uncertainty over the future through the formulation of articulate visions being both bold and realistic. In Dire Dawa, time horizons were set based on two considerations:

- The disruptive character of the future scenarios – in relation with the urban developments and population growth previously described - and the level of uncertainty that stem from it, thus limiting the relevance of going beyond 20 years prospect;
- The need for strengthening capacities locally, favor ownership at local level, as well as awareness and support from the national government and external supporting partners. To that end, a preparation phase seems necessary to well anticipate the implementation of operational projects and ensure the effectiveness of the SUMP.

Thus, the overall schedule of the SUMP divides into four distinct periods of time as sequenced for its implementation:

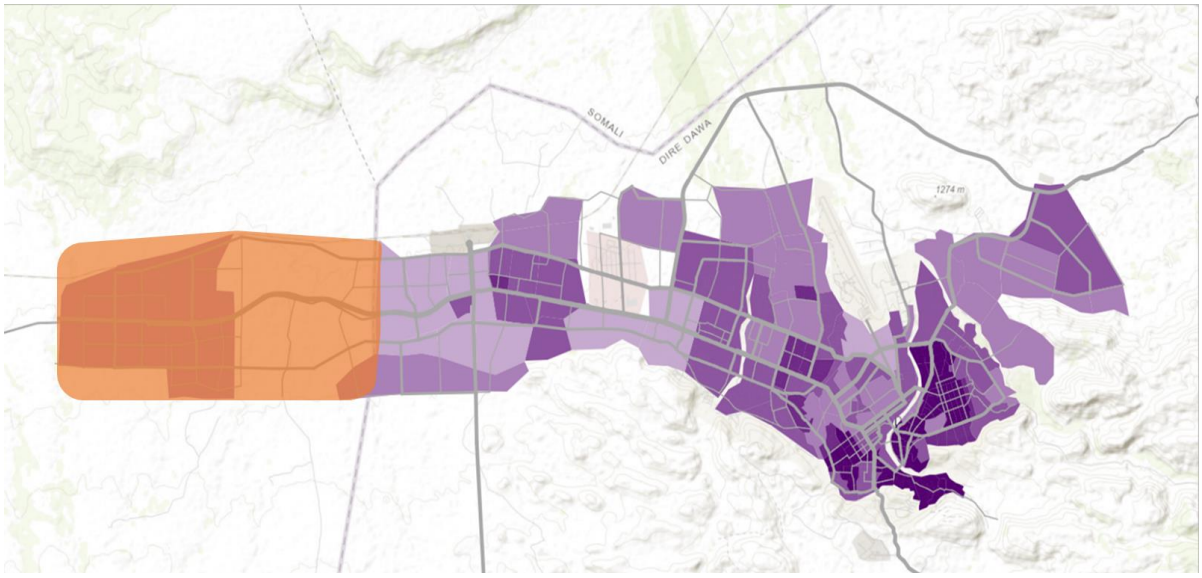
- Preparation phase – 2023-2024
- SUMP short term program (1) 2025-2029
- SUMP medium term program (2) 2030-2034

- SUMP long term program (3) 2035-2039

## Territorial scope

Two different perimeters are considered in the SUMP:

- The **operational SUMP perimeter**, that covers the territory for SUMP implementation. Since Dire Dawa City Administration is the depositary institution for the plan, it is defined by Dire Dawa City boundaries and encompasses the nine urban Kebeles.
- The **enlarged SUMP perimeter** covers Dire Dawa City and the living or economic areas laying in its area of influence. This includes the New industrial park and new city project, for it will affect in a large extent the features of the city and of its mobility in the future.




**Operational (purple) and enlarged (purple & orange) SUMP perimeters**

## Team and development process

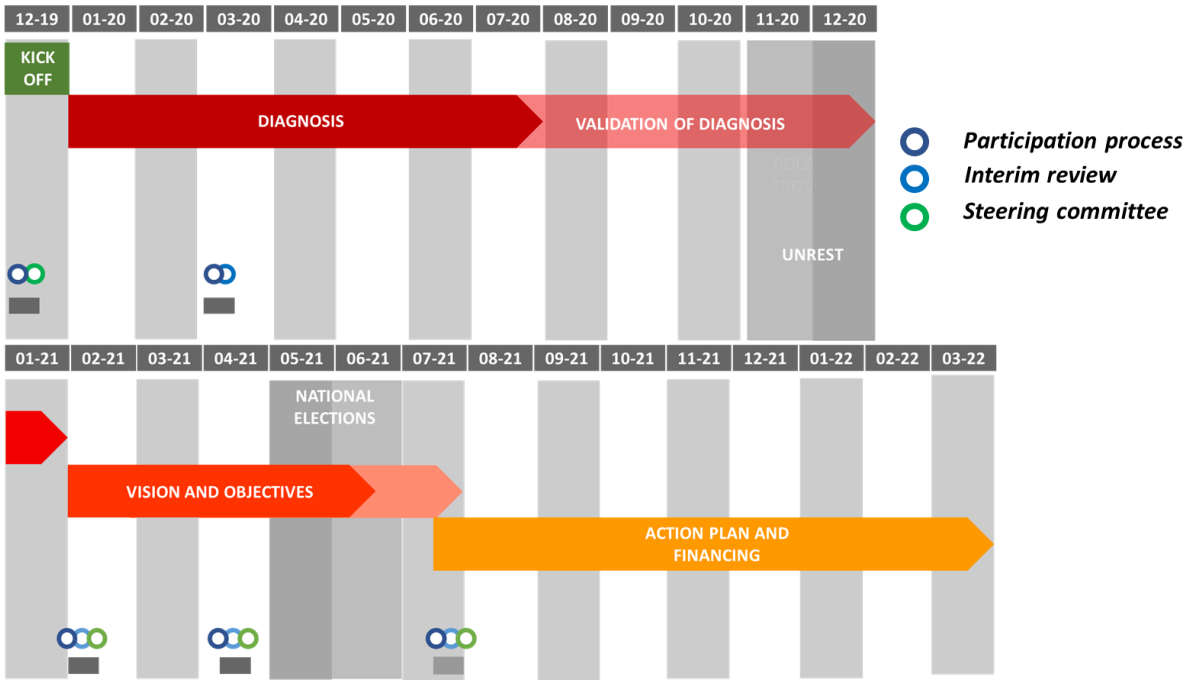
The SUMP governance has been defined jointly with City authorities in the course of the first visit of the consultant in Dire Dawa, thus forming a technical and a steering committee associating all mobility players, both from local and federal administrations. The technical and the steering committee have been met in each of the six missions organized in Dire Dawa along the project, either to present the status of ongoing activities, consult them or make decisions on the SUMP milestones.

| **Steering Committee** *Project decisions* | **Technical Committee** *Project follow-up* |
|---|---|
| City of Dire Dawa<br>▪ Mayor<br>▪ Deputy Mayor<br>▪ Finance & Economic dev. Bureau<br>▪ Land development & management bureau (urban planning)<br>▪ City Manager<br><br>Federal level<br>▪ Transport Authority – DD branch<br>▪ Ethiopian Road Authority – DD branch | City of Dire Dawa<br>▪ Mayor Office advisor<br>▪ City manager (Road Authority, City Bus, UIIDP)<br>▪ Project Office (Biniam, Yonas, Dereje)<br>▪ Urban Planning Department<br><br>Federal level<br>▪ Transport Authority – DD branch |

**SUMP project governance**

In particular, the Project Office, a task force gathering different departments of the City for the management of urban projects, played an important role, supporting the technical activities throughout the SUMP elaboration process. The Federal Transport Authority was also represented in all workshops organized to discuss the SUMP orientations.

The SUMP was developed as follow. Overall conditions have been affected by the sanitary conditions and the political context in Ethiopia, that have episodically limited the collaboration with local counterparts.




**SUMP development process**

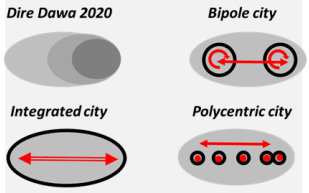
The next chapter detail the consultation activities carried out throughout the process.

## 2.3. Stakeholder engagement

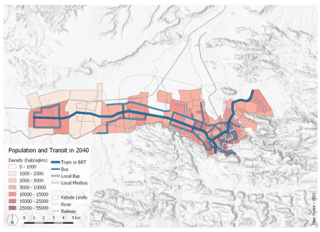
Along the SUMP development process, the institutions and the civil society were largely involved, through a variety of consultation activities:

- **Workshops** with the technical committee were organized to discuss key aspects of the SUMP and ensure the adequation of each product to the local context. In particular, the elaboration of the vision and the development scenario were conducted in a participative manner, in association with technical stakeholders.
- **Interviews** with mobility stakeholders allowed to carry out the diagnosis, collecting information from institutions but also operators, thanks to Bajaj associations. Kebele administrations were also met to have focus on issues encountered in specific areas, typically central markets.
- **Focus groups** were conducted during the diagnosis to shed light on topics referring to relations between mobility and local economy, but also Bajaj perception. While elaborating the action and financing plan, some groups were mobilized once again to have their view on micro action proposals and more generally to fine tune the measure to be formulated, especially regarding NMT and urban marketplaces.

The figure below details the consultation process, as for institutions and the general public. A summary of participative activities is presented in appendix 7.4.

| | MISSION #1<br>KICK OFF | MISSION #2<br>DIAGNOSIS | MISSION #3<br>ISSUES & VISION |
|---|---|---|---|
| **Institutional participation** | - Technical Committee<br>- Steering Committee<br><br>- Interviews with City departments (14) | - Interviews with City departments (5)<br>- Interviews with Kebele administrations (2)<br>- Technical workshop on land use and urban planning | - Technical Committee<br>- Steering Committee<br><br>- Technical workshops about diagnosis main finding and strategical vision (2) |
| **Public participation** | - Household surveys<br>- Opinion surveys | Focus groups (3)<br>- Macro level economic activities<br>- Micro level economic activities<br>- Bajaj users |  |

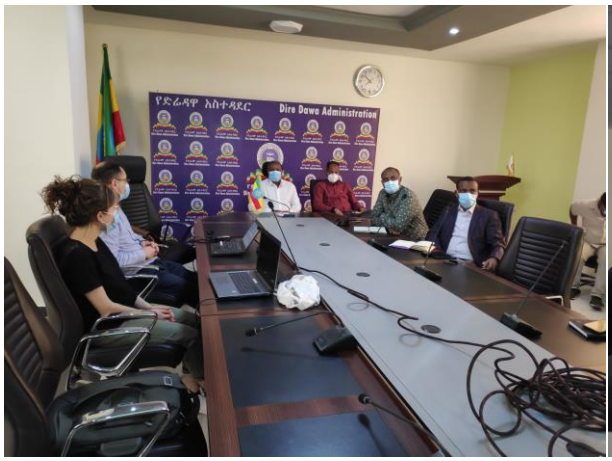
**APPROVAL OF THE DIAGNOSIS OUTCOMES**

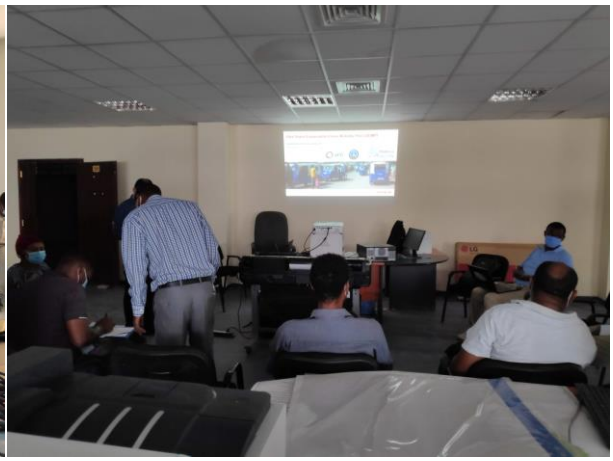
| | MISSION #4 SCENARIOS | MISSION #5 OBJECTIVES | MISSION #6 ACTIONS & FINANCING |
|---|---|---|---|
| **Institutional participation** | - Technical Committee<br>- Steering Committee<br>- Technical workshop about development scenarios | - Technical Committee<br>- Steering Committee<br>- Technical workshop about objectives and action plan framework | - Technical Committee<br>- Steering Committee<br>- Technical workshop about the priorities, schedule and financing plan |
| **Public participation** |  | Focus groups (2)<br>- NMT and especially walking facilities<br>- Urban lay-out and design for marketplaces | |
| | **SELECTION OF THE POLYCENTRIC SCEN.** | **APPROVAL OF OBJECTIVES** | **APPROVAL OF THE ACTION PLAN** |

**Stakeholders engagement process**

**Focus group with Bajaj users, March 2020**

**Focus group with sellers and shop keepers, March 2020**



**Steering committee, April 2021**

**Technical workshop, April 2021**

**Technical workshop, July 2021**

**Focus group on NMT actions, July 2021**

# 3. Status quo analysis

## 3.1. Institutional and regulation framework

The Dire Dawa Region encompasses nine urban Kebeles, that make up the City territory, and 38 rural Kebeles. The Mayor of Dire Dawa and his administration has authority over the whole perimeter, ie both the region and the city. However, the institutional set-up could evolve in the upcoming years according to the urban developments planned, and especially the creation of 4 new rural cities in the rural kebeles of Dire Dawa Region. These cities would have their own government and resources, as well as proper capacities to apply for federal grounds (utilities, services, equipment).


**Satellite view of the nine urban Kebeles**

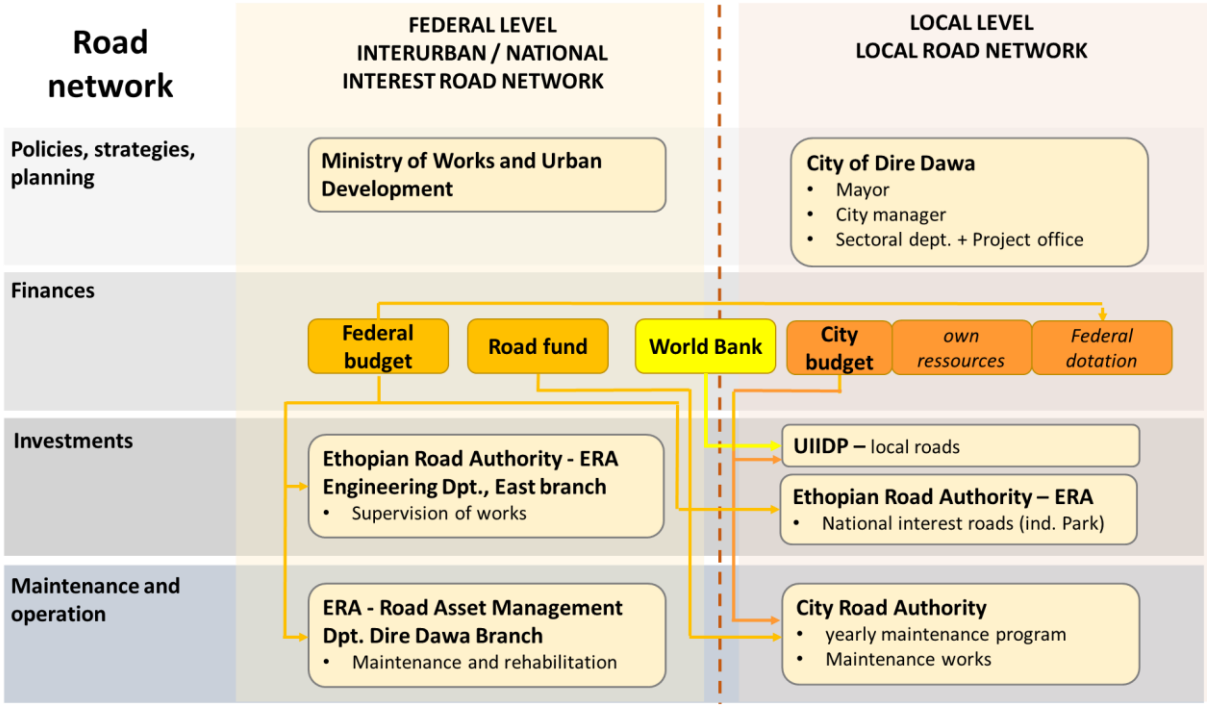
Urban, road and transport sectors are managed at both federal and local level. Although responsibilities and perimeters are properly defined, some interfaces regarding road or urban transports can be uneasy to manage.

### 3.1.1. Road sector

Through the Ethiopian Road Authority (ERA), the Federal Government (Ministry of Works and Urban Development) is responsible for interurban roads lying out of city boundaries and national interest road projects in the city (industrial park), both for investment, operation and maintenance. Besides its direct and overall competence on interurban roads, the Federal Government of Ethiopia finances local roads maintenance by two different means:

- The Road fund, financed by fees collected from cars and distributed evenly;
- The Federal budget, which can top up the road fund with extra money according to priorities, based on condition surveys.

The City Road Authority is in charge of road investment and maintenance. It falls under the authority of the Mayor and the responsibility of the City Manager. Its investment capacity is limited and it mostly intervenes in the definition and implementation of a road maintenance Program. Maintenance priorities are set according to visual inspection or condition surveys. Investment works are mostly carried out by contractors contracted by the City Road Authority. Maintenance works are carried out by the City Road Authority own services.




**Institutional organization for road network management and development**

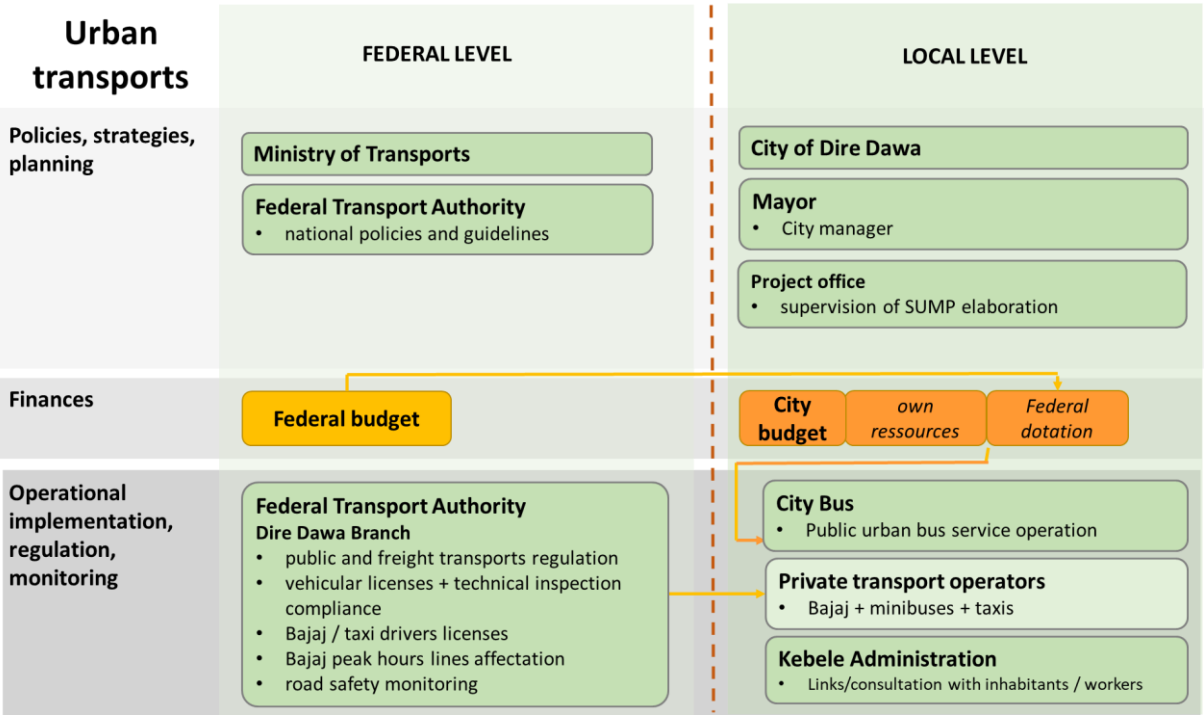
## 3.1.2. Urban transport sector

Regulations are defined at national level and implemented locally by the local branch of the national administration. The Federal Transport Authority (FTA) under the responsibility of the Ministry of Transports regulates Bajaj and interurban transport services through the delivery of licenses and the dialogue with driver associations. However, the capacity of the FTA to actually calibrate supply through licences is limited as licenses can be obtained from other regions, even though not regularly as it is forbidden to operate a transport service in another place than the one where registration is done. Controls and operating rules are not fully enforced.

Mobility planning initiatives are currently mostly undertaken at national level. For instance, a non-motorized transport policy is under preparation by the Federal Transport Authority (FTA). The SUMP of Dire Dawa will be the first local urban mobility plan of the country.

Public urban transport services (City Bus) are marginal in the transport supply in Dire Dawa. The City Bus was created in 2002 service is currently financed and operated by the City of Dire Dawa as a City

administrative department under the authority of the Mayor and the responsibility of the City Manager. It has no resources to scale up and possibly meet broader needs, instead of respond to a very specific demand (administration employees mainly).




**Institutional organization for urban transports management and development**

## 3.2. Financial framework

### Dire Dawa Region and City budget

While the SUMP is focused on the City perimeter, budget is defined at Dire Dawa Region level and financial data are available at this level as well without being disaggregated between urban and rural areas. However, most of the budget applies to the City level.

The regional budget relies on the following resources:

- Proper funds, raised through taxes or charges collection;
- Contributions of Federal bodies, essentially the Ministry of Works and Urban Development and the Ethiopian Road Authority;

The regional budget planned in 2018 for three years was presenting an increase of the budget, from 2 400 to about 3 000 million BRR (69 to 85 million USD) for the current fiscal year. Half of revenues are proper funds. That share was supposed to be steady over time.

Dire Dawa benefits from a strong partnership with the World Bank through five-year long investment programs (Urban Integrated Infrastructure Development Program, UIIDP), aiming at funding public facilities (schools, health centres but also roads). After UIIDP II was completed, representing about 500 and 650 million BRR (14 – 18 M USD) of yearly investment, UIIDP III is now under implementation.

Regarding expenses, special efforts were planned in terms of capital investment, with a rise of 40 and 54% in 2019 and 2020 from the amounts invested in 2018. Regular expenses were assumed to be relatively stable, indicating there was supposedly no anticipation of the investment impact on operation and maintenance.

| EFY | 2011 | 2012 | 2013 |
|---|---|---|---|
| GC | 2018 | 2019 | 2020 |
| **Revenues** | **2 421,6** | **2 663,7** | **2 930,1** |
| Federal Government Subsidy | 1 215,6 | 1 337,1 | 1 470,8 |
| Regional revenue collection | 1 206,0 | 1 326,6 | 1 459,3 |
| **Expenses** | **2 421,6** | **2 663,7** | **2 930,1** |
| Regular | 1 701,9 | 1 656,6 | 1 822,3 |
| Capital | 719,6 | 1 007,1 | 1 107,8 |
| ***Balance*** | ***0*** | ***0*** | ***0*** |

**Planned regional budget between 2018 and 2020, in millions BRR – source: City Administration, 2018 (completed with UIIDP figures)**

## Transport sector budget

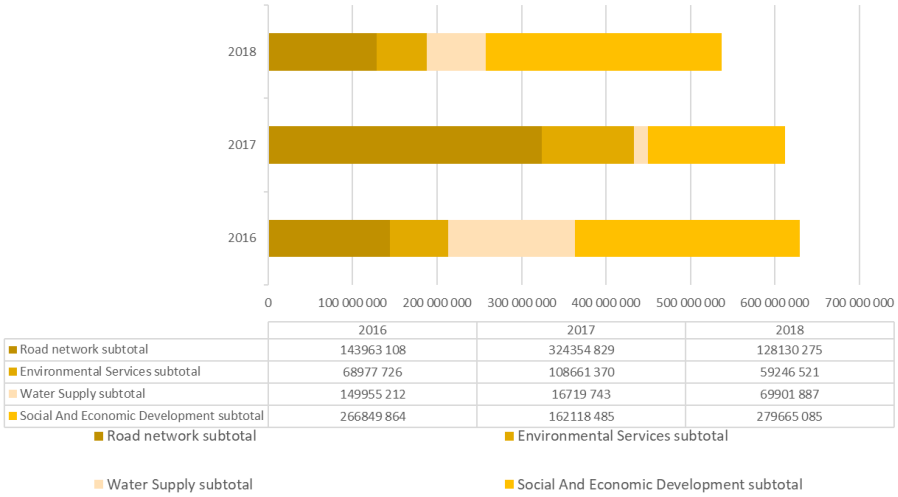
Globally, the budget for the urban transport sector was set between 480 and 655 million BRR (14 – 19 M USD) in the past few years. The urban transport sector is mainly funded by the City (70% to 80% of the sector budget over the past three years), although the share of UIIDP in capital investment has become bigger, until exceeding 50%. Recurrent expenses (20% of expenditures) seem disconnected from capital expenses (80%), reflecting a lack of integration between development planning and operation. Maintenance costs are not assessed ahead of implementation, which may induce some financial challenges in the future.

| EFY | 2010 | 2011 | 2012 |
|---|---|---|---|
| GC | 2017 | 2018 | 2019 |
| **Revenues** | **654,8** | **609,4** | **548,0** |
| City budget | 454,0 | 373,1 | 319,1 |
| City budget as contribution to UIIDP | 63,7 | 85,1 | 78,2 |
| Road fund | *8,2* | 9,0 | 9,9 |
| IDA | 128,9 | 142,1 | 140,8 |
| **Total expenses** | **652,3** | **606,8** | **545,5** |
| **Recurrent expenses** | **116,6** | **116,6** | **117,7** |
| City bus operation | 5,0 | 4,1 | 4,2 |
| Road maintenance | *111,6* | 112,5 | *113,4* |
| **Capital expenses** | **535,7** | **490,3** | **427,8** |
| UIIDP | 192,7 | 227,2 | 219,0 |
| Road development | 343,0 | 263,1 | 208,9 |
| Bus acquisition | *2,5* | *2,5* | *2,5* |

**Urban transport budget in million BRR, between 2017 and 2019 (2010 and 2012 EFY) – source: City Administration, UI-IDP, 2019**[1]

Overall, capital investment has decreased by 20% between 2017 and 2019, as a result of:

- **The slight rise of UIIDP annual budget over the period**, thus accounting for more than half of the total capital investment in 2019. In 2017, a strong effort was put on the road network and related facilities, with a massive investment of 324 million BRR (9 M USD), amounting to about half of the total capital investment of that same year. Hence, 190 km of roads were reported to be constructed in 2018, whereas 20 km were realized respectively the year before and the year after.
- **The cut in the road development budget of the City**.




| | 2016 | 2017 | 2018 |
|---|---|---|---|
| Road network subtotal | 143963 108 | 324354 829 | 128130 275 |
| Environmental Services subtotal | 68977 726 | 108661 370 | 59246 521 |
| Water Supply subtotal | 149955 212 | 16719 743 | 69901 887 |
| Social And Economic Development subtotal | 266849 864 | 162118 485 | 279665 085 |

**City capital investment between 2016 and 2018 per sectors – source: UIIDP, 2019**

Public transports, overwhelmingly Bajaj supply, are fully funded by private and independent actors. Operating Bajaj is lucrative, although not highly profitable since the daily net benefit is about 3 USD. High vehicle costs due to taxes and market organization prevent make vehicle renting of little profit.

| | **Urban transport sources of funding** | |
|---|---|---|
| | **Investment** | **Operation & Maintenance** |
| Road | City of Dire Dawa (own resources + Federal dotation)<br>World Bank | Federal government (Road Fund)<br>City of Dire Dawa |
| Public bus | City of Dire Dawa | City of Dire Dawa |

**Scope of responsibilities in transport funding**

Regarding City Bus, it is interesting to note that they consider the possibility to contract bus operation to private operators and partly fund it through its own subsidy. This outsourcing method was success-

[1] Figures in italic are extrapolated.

ful with the water company and may improve the quality and profitability of the service without impacting fares too much. However, the way to involve the private sector in a business that is structurally loss-making is seen as an issue, especially in a context of rising demand and urge for supply upgrading.

## 3.3. Planning framework

There is a long existing planning culture in Dire Dawa, with successive generations of urban masterplans in 1937, 1967, 1979, 1994 and 2006. Land use maps have supported the definition of urban policies getting as close as neighborhood level to promote a balanced development and efficient functioning of the city.

The current 2006 Spatial Development Framework (SDF) is under revision to issue a new Urban Masterplan. No specific mobility planning document currently exists but an overall strategy defined in the Integrated Development Plan (IDP, 2006) features transport wise orientations, though not turning them into an action plan.

| *Date* | *Plan* | *Authority* | *Purpose* |
|---|---|---|---|
| 1937 | Piano Regolatore di Dire Daua | Italian occupation forces | Definition and regulation of urban expansion |
| 1967 | Master Plan | Ministry of the Interior | Definition and regulation of urban expansion |
| 1979 | Detail Plan | Ministry of Urban Development and Housing | Master plan defined for 8 years |
| 1994 | City Master Plan | National Urban Planning Institute | Master plan defined for 20 years |
| 2006 | Integrated Development Plan (IDP) | Federal Urban Planning Institute & City Administration | Overall development strategy nationwide defined for 5 years, including education, social, economy, land, etc.[2] |
| 2006 | Spatial Development Framework (SDF) | City Administration | Component of the IDP for urban development (equivalent to a masterplan) Spatialized objectives in terms of land use and road network for 10 years |

**Background of urban planning documents**

The Integrated Development Plan (IDP) featured an urban transportation study aiming at formulating a strategy to address the main transportation issues at city level. According to the 2015 IDP evaluation, only one part or strategical objective (namely Goal 1) out of the four detailed in the IDP has been considered in the SDF, which is the operational document. The graphic hereafter summarizes the overall strategy transport wise.

[2] IDP is inspired by the South African planning approach.


**IDP strategy for the transport sector – source: Evaluation of the Implementation of the Integrated Development Plan (2005 – 2014 IDP/SDF) of Dire Dawa, Planning Component: Transport Sector**

## 3.4. Demographical data and urban development

### 3.4.1. Demographic dynamics

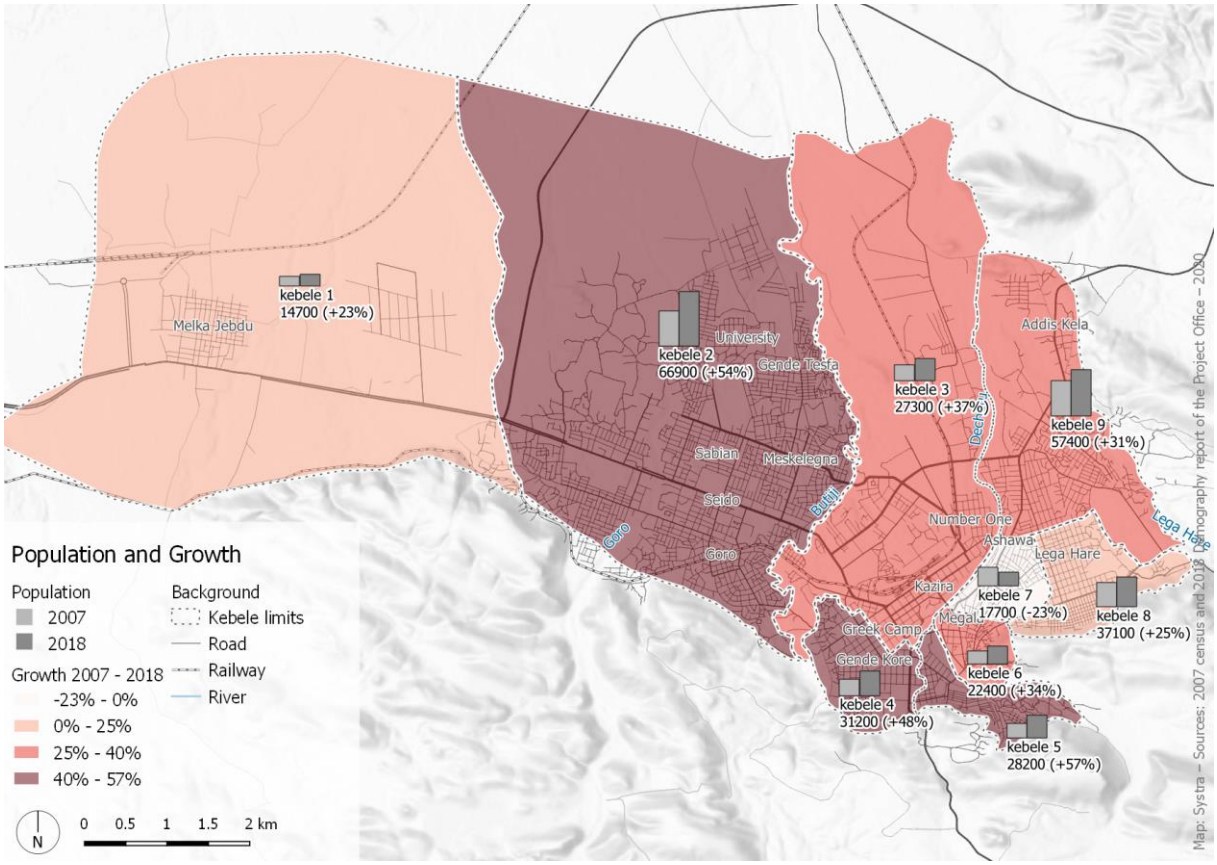
#### Population growth

The total population of Dire Dawa City for 2018 was estimated to 319 000 inhabitants, including 16 500 migrants. When considering the Region of Dire Dawa – the 9 urban kebeles and the 38 rural kebeles – total population reaches 495 000, rural Kebeles accounting for 36% of the total. Looking at population growth over the last ten years ( 10 years before the 2018 census to be exact) urban Kebeles have seen their population grow by 30-40%, while rural population has grown by 60%.

| *Year* | *Urban population* | *Rural population* | *Total population* |
|---|---|---|---|
| 2007 | 233 200 | 108 600 | 341 800 |
| 2018 excl. migrants | 303 000 | 176 000 | 479 000 |
| 2018 incl. migrants | 319 476 | 176 000 | 495 476 |

**Population of urban and rural Kebeles of Dire Dawa – source: Report on Demographic Study, 2019**

Population growth over the last decade confirms the identification of Kebele 2, 4 and 5 as major expansion zones, with a growth rate comprised between 48 and 57%, far above the average. However, the respective weight of the different parts of the city was not significantly changed. Especially, the densest parts of the city (Kebele 4, 5, 6) keep gaining population at a regular pace, above the average (32%). This raises some concerns regarding density and therefore the provision of housing and basic services locally Although its development was also planned in the 1990s, Melka Jebdu still appears as an emerging pole, with population growth lower than the city average (23% against 32%). In 2018, it is the least populated Kebele.

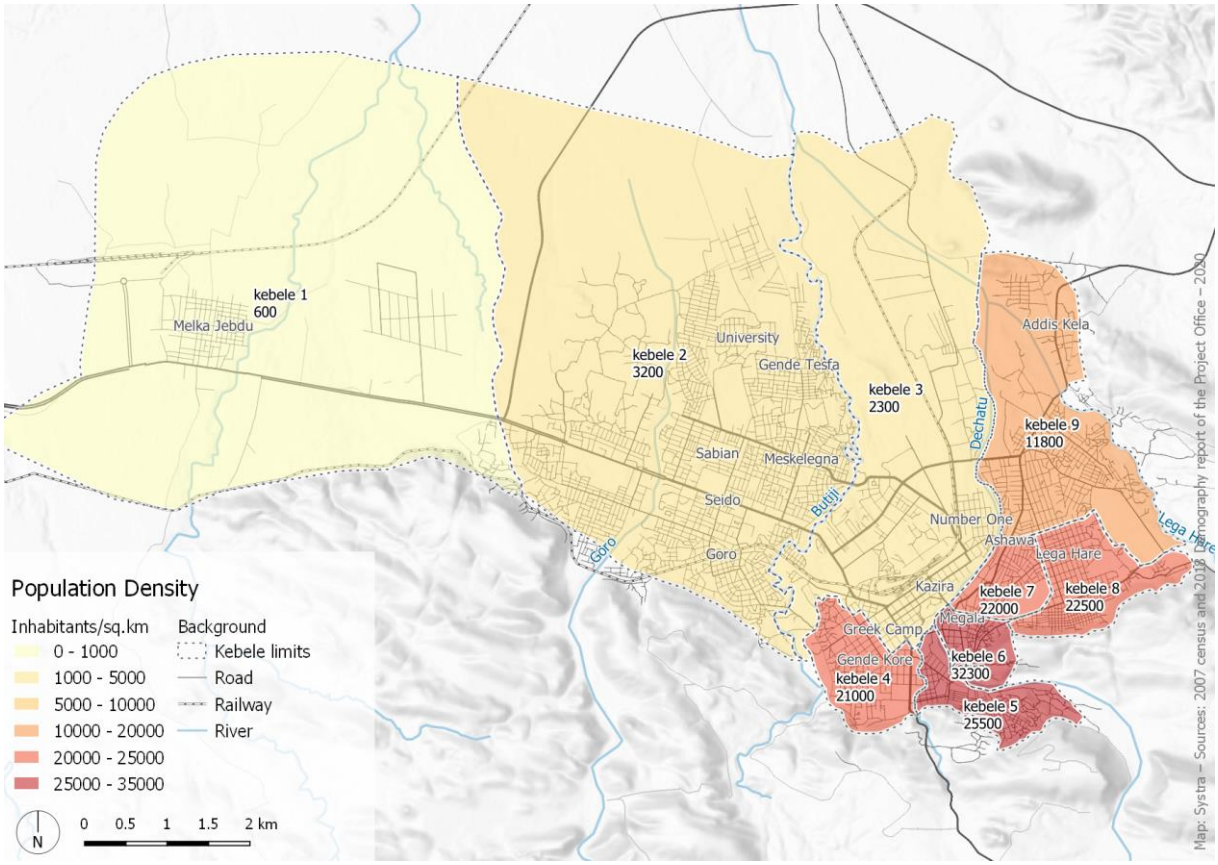



**Population growth per Kebeles – source: census 2007, adjusted with 2018 household survey**

## Population density

Population density in 2018 outlines an important contrast between the south-east of the City (Kebele 4 to 8) where density exceeds 20 000 inhabitants per square kilometre and the rest of the City, where it can get much lower (less than 5 000 inhabitants per sq. km for Kebele 1 to 3). This tends to highlight:

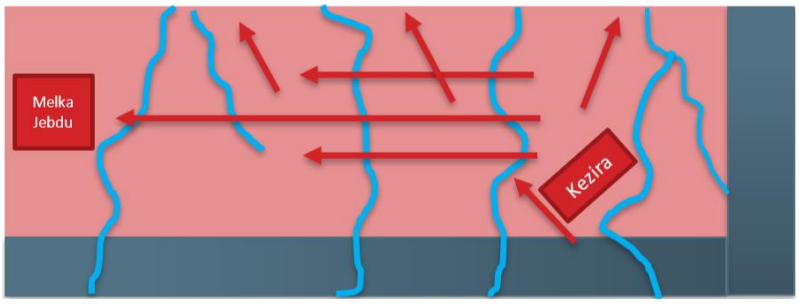
- The demographic pressure existing in Gende Gore, Kefira and Lega Hare, yet constrained in their development by the topography. This is to cause difficulties in terms of urban and transport planning;
- The persistent attractivity of the historical and commercial heart of the city, possibly related to mobility constraints and the need to live close to the main urban opportunities;
- Partial achievements of previous urban policies, aiming at expanding the city to the West and the constitution of sub-centres, consistently with the existing layout, or in a concentric manner.




**Population level and density per Kebeles - source: census 2007, adjusted with 2018 household survey. Central Statistics Authority (CSA) / City of Dire Dawa – Project Office**

## 3.4.2. Urban structure

Dire Dawa is located in the east of Ethiopia at a flying distance of 350 km from Addis and 250 km from Djibouti. Road distance is higher, 500 km from Dire Dawa to Addis and 300 km to Djibouti. Physical features (rivers, mountains) constrain the urban development (longitudinal, along the plain) as well as mobility across the territory, due to the limited number of bridges. Dire Dawa being a flood prone area, it also raises the requirements for infrastructures, including roads and bridges.

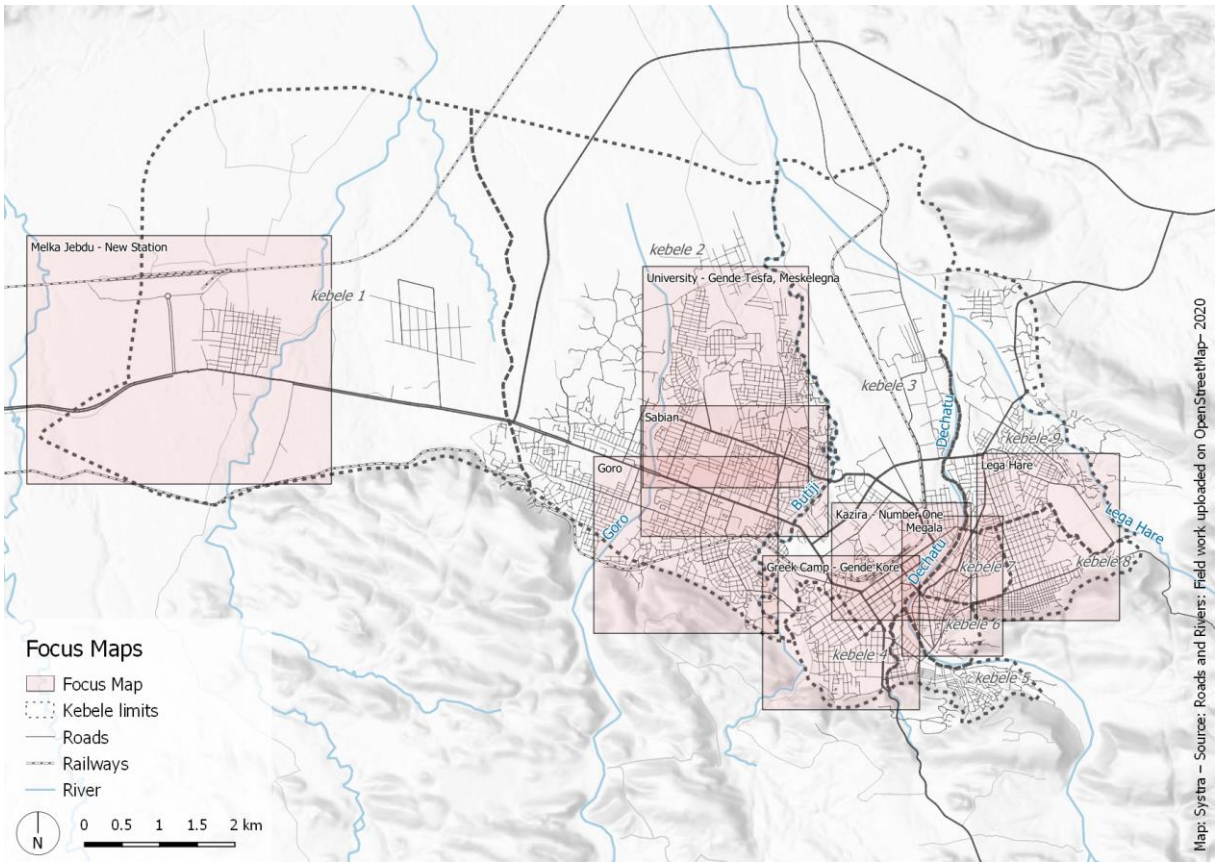



**Schematic view of the territory constraints and circulation axis**

The core of the city is organised on both sides of the Dechatu river with two distinct areas: Kezira on the west bank and Ashawa/Megala/Kefira on the east bank. The former is the historical railway district of the city built on a regular shape on European standards and accommodating different administrations and facilities. The latter is the historical trade district which still concentrates dense commercial

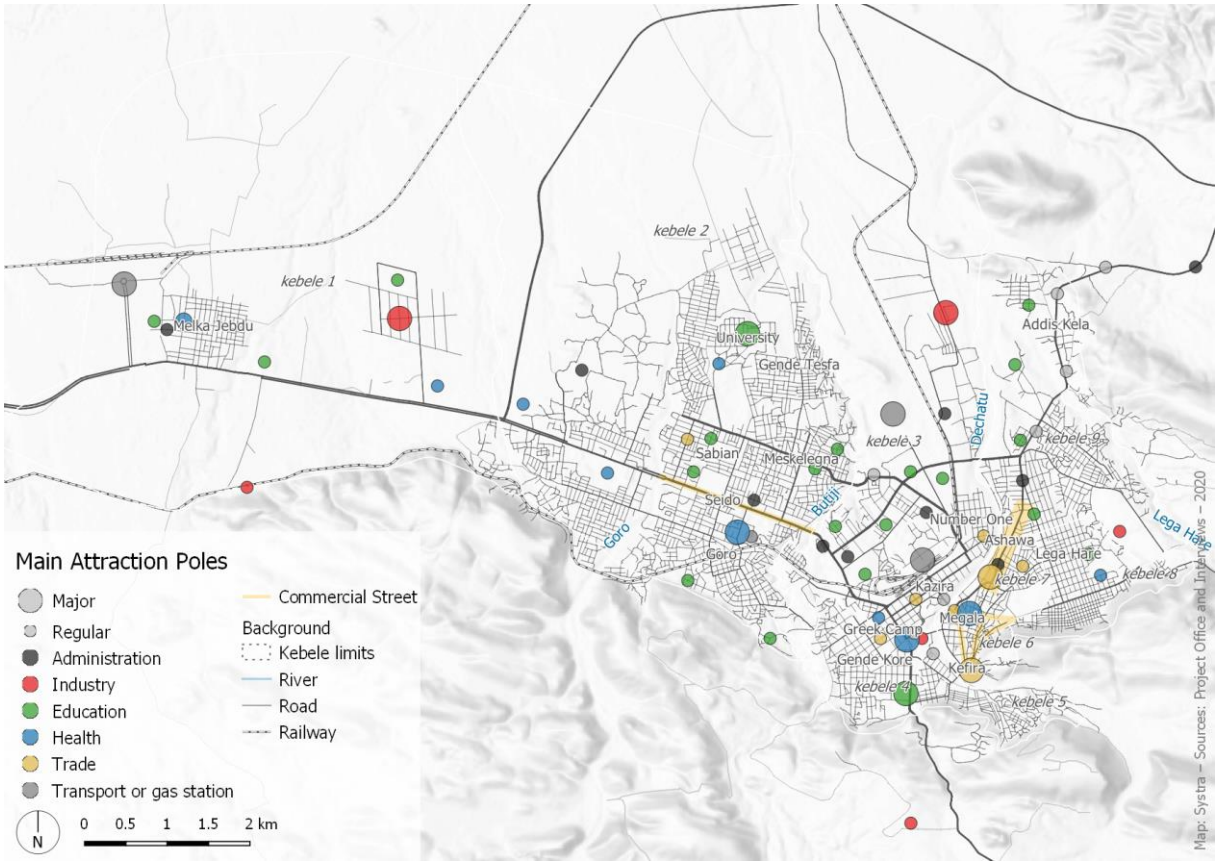
activities on a pattern of smaller irregular streets. Lega Hare is a residential area developed from the late forties east of Megala/Ashawa.

Sabian has developed as sub-centrality with a balanced mix of residential functions and economic activities. It is densifying on the main east-west road with-multi storey buildings. Goro is a more residential district located south of it with some ongoing informal development on the slopes. To the north, some residential areas (Gende Tesfa, Meskelenia) contrast with the wide area taken over by the University of Dire Dawa.




**Main districts of Dire Dawa**

Mobility generators are fairly well distributed in the city. Main administrative and educational generators are located in distinct areas but the main markets are concentrated in the city centre in Megala and Kefira. This latter situation generates extended trips from the whole city and beyond, affecting locally mobility conditions in dense neighborhoods not fully fit to accommodate such important flows of goods and people. Among the trips motivated by non-constrained purpose (40% of the total daily trips), one out of four is related to shopping and is likely to be reiterated several times a week.




### Mobility generators

Five main economic development areas can be found in Dire Dawa:

- Two main industrial parks, one located to the west between Sabian and Melka Jebdu and the other in the Hamdael area neary the airport along the freight route to Djibouti. The two sites together host 48 manufacturing industries, and account for 20% of the total.
- A new industrial park is planned out of the city boundaries between the new station and Hurso to the west. It currently hosts a brand-new textile factory.
- Three cement factories, one at the southern edge of the city by the Harar road and the two others one south of Melka Jebdu
- A textile factory on the eastern fringe of Lega Hare

Satellite view of the western industrial park

Satellite view of Hamdael

Dire Dawa presents a high density of commercial activities including markets, especially in its historical core and along the main east-west road. It makes the city attractive beyond the urban area, thus generating important flows of goods and people at different scale, putting some pressure over roads and public spaces.

Top : Kefira market
Down : Taiwan market

Top : Ashawa market
Down : Seido market

**Markets and mobility constraints**

Most of the marketplaces are located in Kebele 6 and 7 where competition runs high for street spaces between mobility needs and selling functions, generating congestion and conflicts between and within the two:

- Pedestrian flows mix with Bajaj, Force and horse carts used to carry the goods;
- Products are often delivered directly on the side of the street, thus generating congestion, abusive occupation of the pavement and possibly losses of the goods;

- Pavements are also encroached by informal trading activities carried out on the street, taking advantage abusively of opened and easily accessible space, resulting into conflicts between formal markets/shops and informal street stalls;

In some cases, market attractivity for customers gets lower as an impact of traffic jam and impediments on accessibility. Some of them may ask for discount as a compensation for transportation cost. Some may also prefer less congested area for shopping, closer to their residential place.

Besides mobility issues, petty crime and health problems have been reported, as a result of concentration of people and economic activities on one hand and lack of waste collection on the other hand. Organic wastes are commonly abandoned on the street or thrown in open collectors, thus altering the road network performance and capacity.

### 3.4.3. Foreseen developments

Dire Dawa was created as a railway boom city in the early 20th century and has been growing ever since. The city is now potentially at the early stage of a new step of its development with a new railway line replacing the old one and full road connectivity to be soon achieved with the planned new highway to Addis. Along with strong urban population growth prospects (new industrial estate / new districts), the scale of its development could then radically change in the coming years.

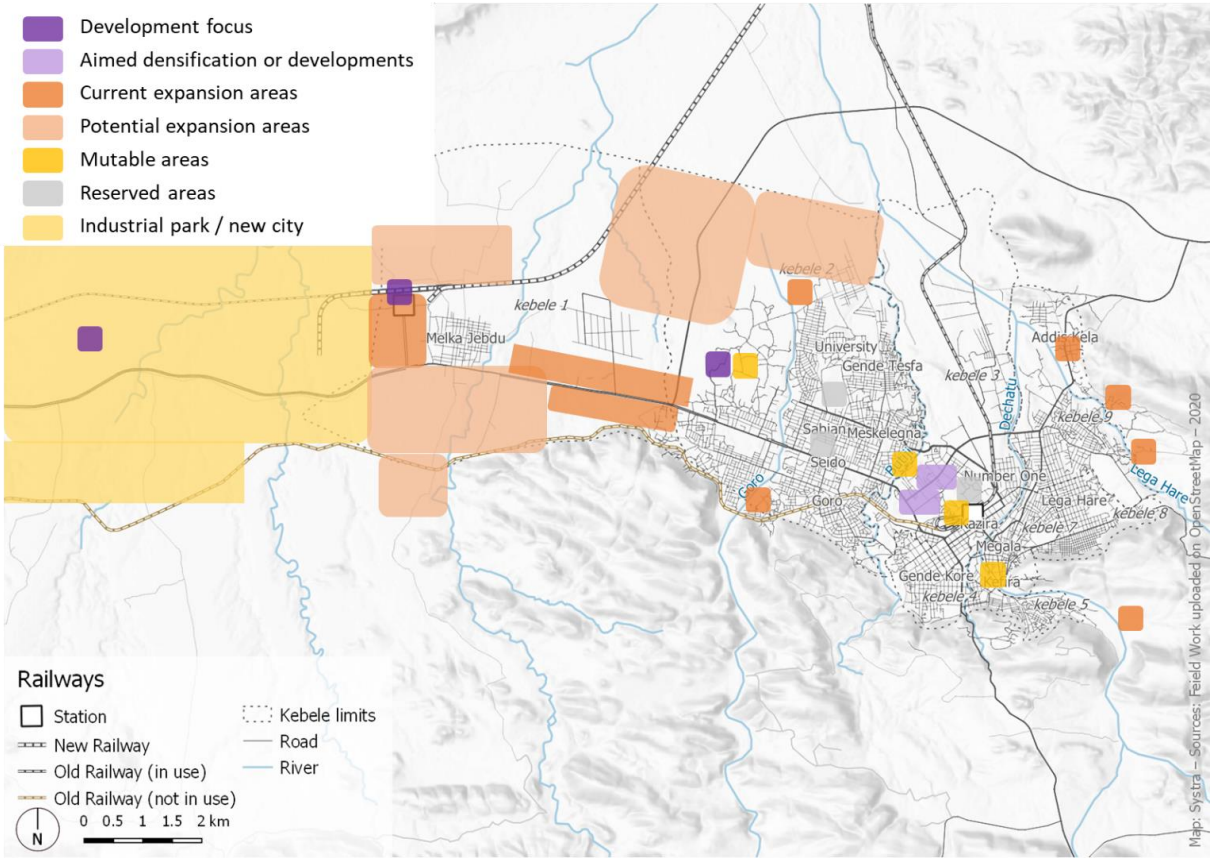
This change of scale of the city could prove disruptive for the mobility system. The current one would prove unfit to care for a city possibly doubling its surface, organising itself according to new patterns and accommodating a much-increased population. The current mobility system would not adapt or scale up to this new context but should rather be substantially transformed.

#### Urban perspectives

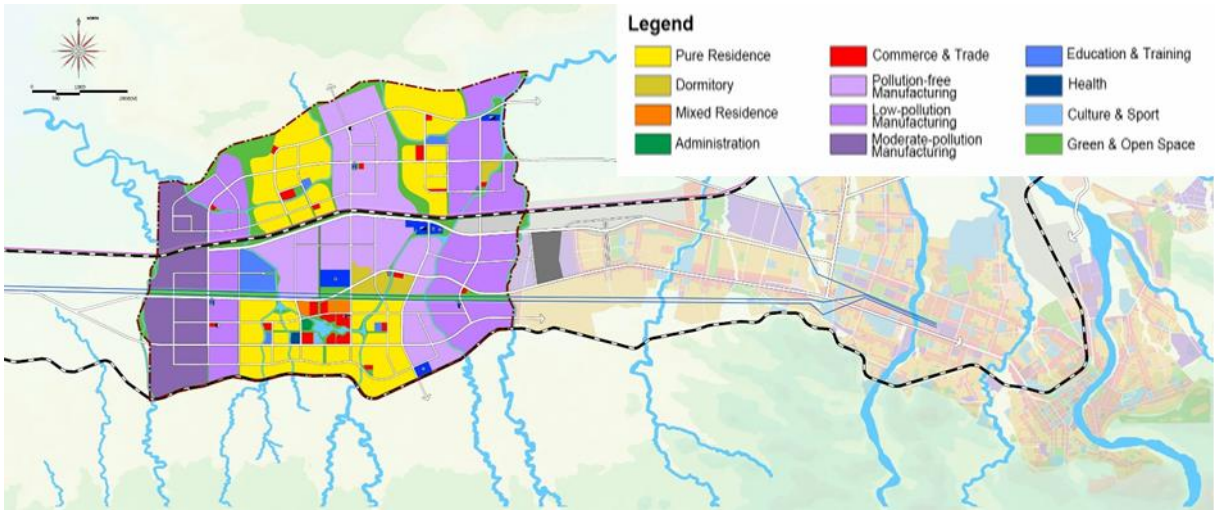
The City tends - and is meant - to spread along the main road toward the west, which may increase mobility needs and trips distance in the future, thus inducing new concerns, depending on the type of urbanization, either planned (ie with activities and services) or spontaneous and informal (i.e. not serviced and mainly residential). Informal developments remain an issue, and institutional capacities do not yet allow to take the lead in housing provision or to propose alternative solutions.

The City Administration also contemplates extensive urban developments meant to deconcentrate Dire Dawa population from the historical center and prevent further densification related to rural migrations. 4 new cities are thus planned in the surroundings of the existing urban area. A ring road would support this change of scale and connect these new settlements to the main road network.

Besides, The Federal Government intends to make Dire Dawa the eastern economic hub of the country, counting with 12 000 hectares of industrial park. In that perspective, an industrial park and new city are planned by the Federal Government west of Melka Jebdu over 42 sq. km on each side of the new railway line. It is served by an 8 km long recent extension of the east-west road. In about 20 years, it plans to accommodate 260 000 jobs and 350 000 inhabitants (about the current population of Dire Dawa City). This project would radically transform the mobility patterns of Dire Dawa.




**Foreseen developments at city scale**




**Conceptual land use plan – source: Futurepolis Design & CADZ, 2017, Ethiopian IPDC Dire Dawa Industrial Park Concept Plan**

## Demographic perspectives

The urban structural plan under preparation considers a land demand estimate based on the foreseen population of the urban area by 2030, as well as on the estimated gap to overcome for housing supply. The demand forecast by 2030 corresponds to an annual growth of 4%, that is an average value between:

- the annual growth rate over the 2012-2018 period, not taking into account the floating population estimated for 2018 (3.5%)
- the annual growth rate over the 2012-2018 period, taking into account the floating population estimated for 2018 (4.5%)

The table below details population projections according to an "average" growth, depending on assumptions for 2018. It is important to note that these elements are established by the City Administration and do not consider the New Industrial Park in course of implementation, for it lays beyond the City boundaries.

| | 2018 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| **Urban population excluding floating population** | 303 000 | 397 004 | 464 149 | 576 536 | 716 135 |

Projections for the urban population of Dire Dawa city – source: Structural Plan, 2021

The contemplated program for the NIP has been first described in a concept plan (2017). Later on, a feasibility study (2018) has detailed the population contemplated for a 2 km² stretch of the NIP in phase 1. Related population density is about 7 500 inhab./km².

| | Jobs | Population | Surface (km²) | Pop. Density |
|---|---|---|---|---|
| **Concept plan** | 250 000 | 350 000 | 42 | 8 300 |
| **Feasibility study** | 8 000 | 17 000 | 2 | 7 500 |

Population and jobs of the NIP according to planning stage – source: IPDC

## 3.5. Mobility and transport

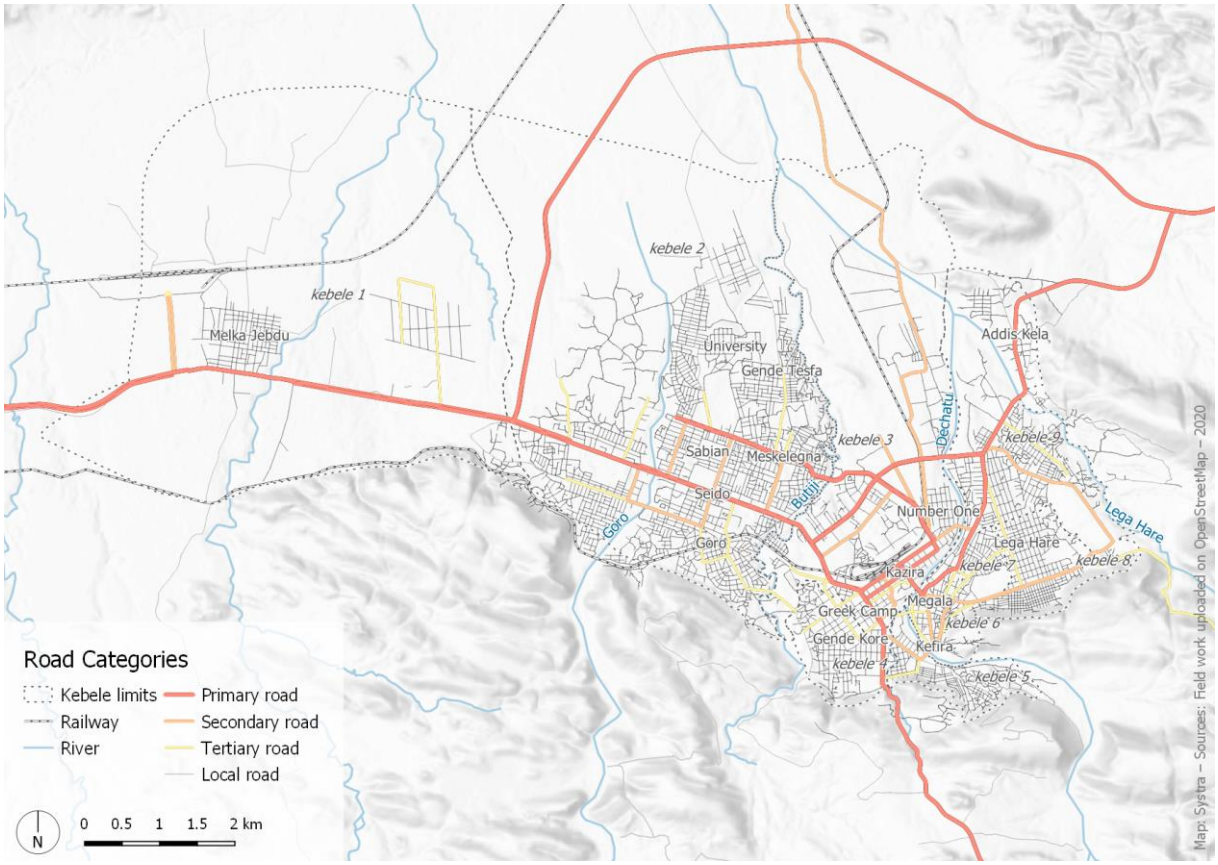
### 3.5.1. Transport infrastructure and transport services supply

#### Road network and crossroads

The overall structures and features of the road network in Dire Dawa are defined by topography (moutains to the South and East), by the constraints of five rivers, by connections with the wider regional and national road network (to the south and the northeast, but not yet to the west) and by existing urban areas and ongoing urban development to the west.

Global road pattern has as rather good shape. Dire Dawa road network is hierarchized with clearly different levels of roads according to their functions and type of traffic. It is able to bear without major disturbance the different mobility flows going through the city, whether for transit, exchange or internal purposes.

However, it is not fully working as a comprehensive road network featuring duly hierarchized and well-connected road. However, the network is extremely unbalanced with an overwhelming weight of local roads and a limited lineage of structuring ones (primary, secondary, tertiary). The structuring road network makes then a rather loose and wide grid with roads set wide apart with little connectivity with each other. A number of missing links are reported in the overall main network. Conversely, there is a very important mileage of local roads, deriving from the urban parceling process, but their functions are limited to local neighbourhood access.




## Road network structure

**Primary road**

Main East West road

**Secondary road**

East West southern road

**Tertiary road**

Main street in Goro

**Local road**

Local street en Gende Kore

**Road typology**

There is a global adequation between road function and profile, notwithstanding focused inconsistencies with some roads holding important functions with a narrow profile while some others are widely dimensioned with limited functions. Generally, roads have no full homogenous layout and capacity from one end to the other. Road equipment is scarce, does not come in a comprehensive way and rarely maintained when existing, especially concerning drainage system, road signage and pedestrian-friendly facilities.

Road surface conditions are generally fair on the main road network which indicates adequate initial structural design as well as effective maintenance. However, these condition get not so good in the lower levels of the road network with lighter design and less maintenance, especially regarding surfacing and drainage system.

Climate hazards are also a challenge. Providing climate proof roads requires extra engineering and imposes significant constrains in terms of planning, design and financing. As an example, the first bridge of the city was constructed no earlier than 1970, revealing the difficulty to implement such a critical infrastructure and there are still more wades than bridges to cross the Dechatu river.

**Cobbled streets and cobblestones**

Cobblestone surfacing has been brought in Dire Dawa as early as 1942. In 2007, the technique spread wider in Ethiopia, through the initiative of the by-then Dire Dawa mayor who was intending to encourage it in his city. 2 years later, a program was launched jointly with the GIZ to support that same goal. It featured cobblestone paving in 13 universities that were under construction.

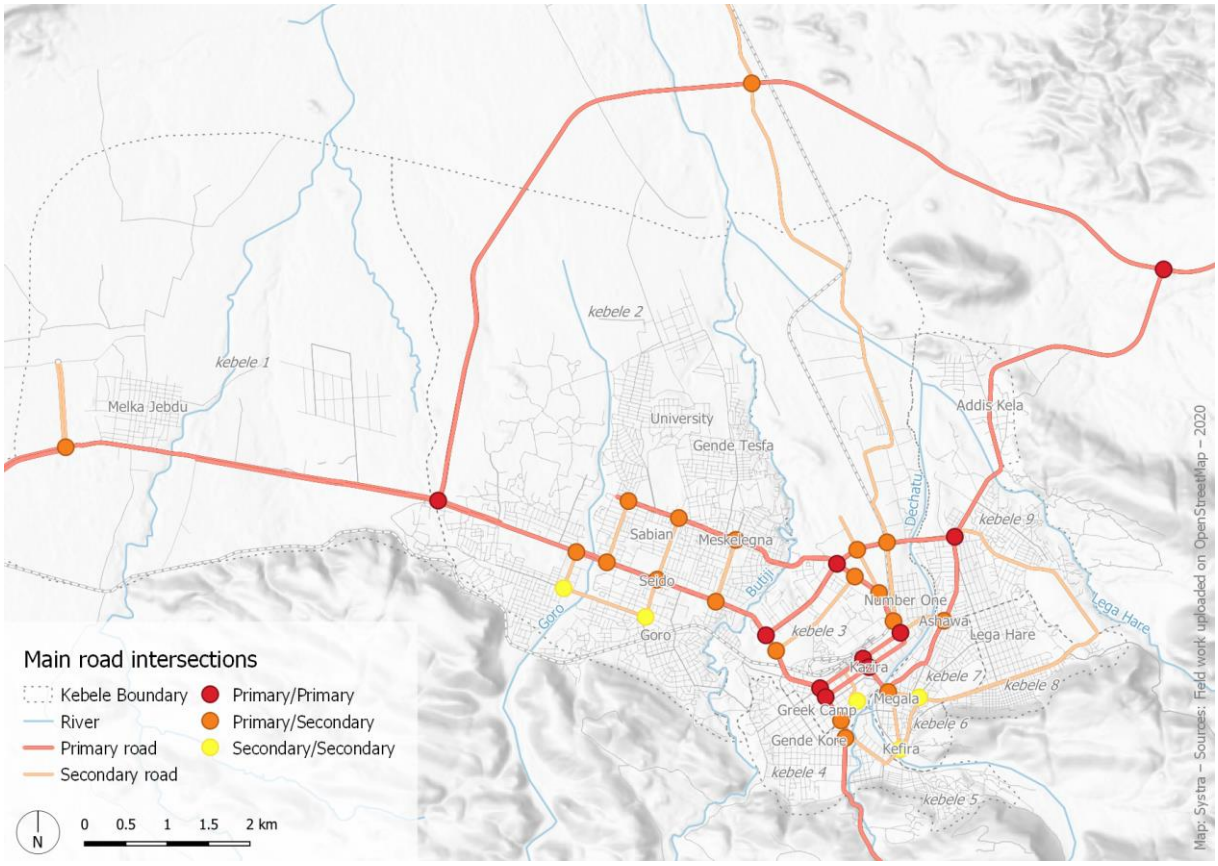
German manager thus capacitated local labor force to produce, install and maintain cobblestone streets.

The cobblestone fits perfectly to the local context, in addition to its inherent quality of robustness, permeability, maintainability and appearance. Produced locally, it has also turned into a local know-how, as for its implementation and maintenance, thus keeping the economic benefits locally.

## Traffic management

Thought not being fully optimized, the road network is roughly fit for the purpose. It allows the main traffics to flow in acceptable conditions of time and safety through the different parts of the city. However, road layout and traffic management are not optimized for traffic flows. Nominal road capacity is rather good on the main axis regarding the width of the roads, but effective capacity is falling far beyond. This can be explained by a number of disruptions:

- Successive crowding out effect of different types of users: street sellers pushing pedestrian from pavement to roadside, Bajaj drivers parking on road side and pushing thru traffic on the middle lanes, etc.
- Sub optimal traffic regulation, especially at crossroads, making them points of congestion,
- Street users' behavior which generates congestion or conflicts between drivers, between drivers and pedestrians, etc.



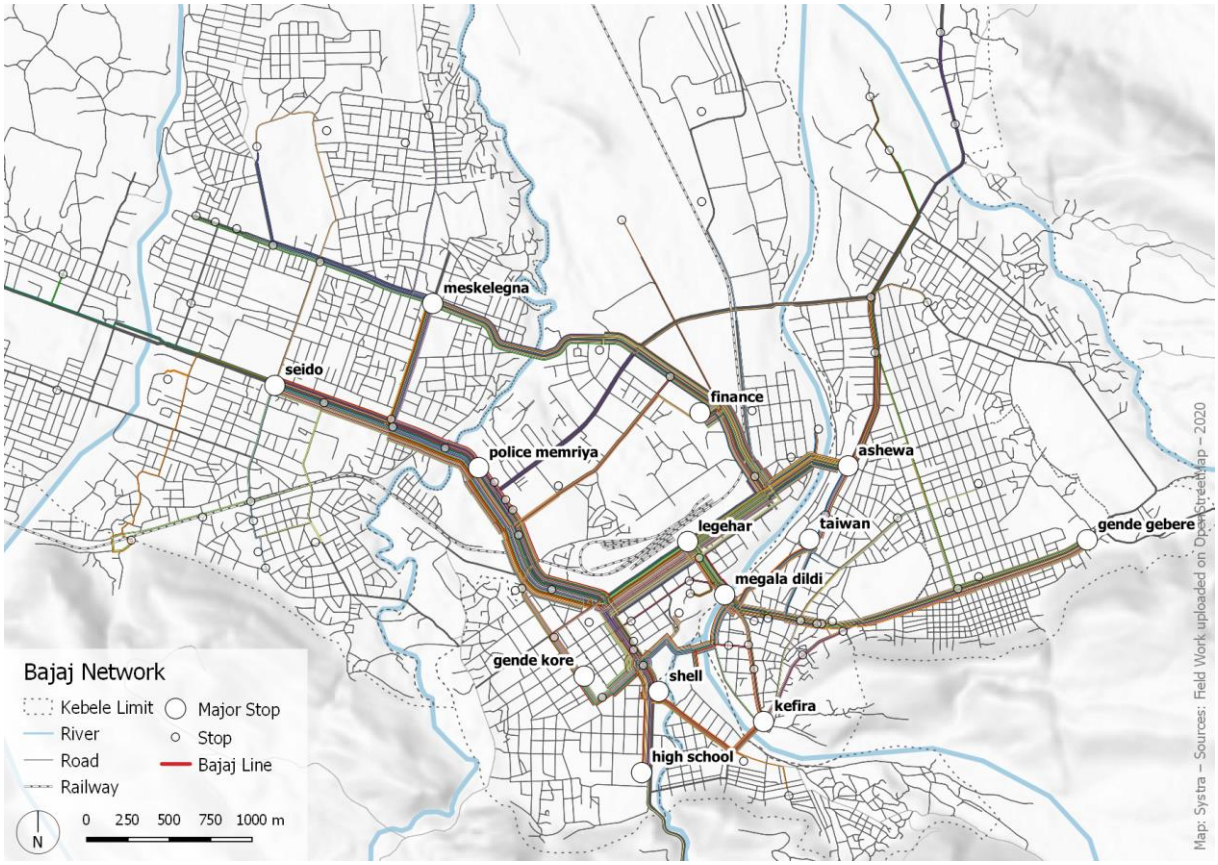
**Main road intersections**

## Public transports

The public transport supply encompasses:

- Bajaj – it is a fully private service that only targets the most solvent market segments and does not address properly the others, leaving some mobility demand unanswered. Variability of fare and uncertainty of total travel time are issues for Bajaj users, who call for regulation, at least regarding fares, coverage and driving behaviors.
- Minibus – it stands as a complementary supply to Bajaj, with few minibuses providing service on three routes connecting Sabian with Megala and Kezira, at peak hours. Company and school services also add up as collective transports.
- City bus – it figures the only publicly operated service City bus is very limited and consists in 10 urban routes limited to peak hours (four rides a day).

With about 6 000 units, a hundred lines and a share of 41% of total daily trips, Bajaj represent most of the public transport supply and can be used for both people and goods. Bajaj supply varies quite a lot between trunk section on main avenues, where it is abundant, and local streets, where it is scarcer. The same difference applies in time where supply is large in peak hours and base days but gets scarcer otherwise (evening, weekends). Main hubs are located in Kebele 3, 4, 6 and 7 near main mobility generators (markets, administrations, old railway stations, etc.).



**Bajaj line network**

Bajaj services are privately operated by independent drivers who mostly own their vehicle. All are registered by the FTA, that stands as the relevant authority for the service, with a regulatory power softly expressed through compulsory operation on fixed routes in peak hours (from 7 to 8.30 am and from 11 to 12.30 pm). As a consequence, their service and according fares are strictly dimensioned to cover cost and make profit.

Two types of Bajaj services are proposed. The cheaper 'line' one is close to a regular public transport and operates on fixed routes at a cost of about 3 to 5 BRR (flat fare). The more expensive "contract" one is operated like a "point to point" taxi and can cost up to 50 BRR. These two services are not equally available along the day nor evenly distributed across the city, the contract form being the most common in off-peak hours and on weekends. Indeed, drivers prefer to work as taxi like "contract Bajaj" rather than public transport like "line Bajaj" while public demand is overwhelmingly in favour of the cheapest "line Bajaj" option (83% of trips). Bajaj supply results well targeted to its market core but faces strong limits on its fringes.

Foreseen population growth and urban developments are likely to increase mobility demand and may well push this micro transit system against its capacity and relevance limits, thus opening the way to find more adapted transit solutions.

**Main issues as seen by the Bajaj drivers**

The Bajaj-driver associations underlined the main issues affecting their business in an interview with the consultant. They are the following:

- The limited number of infrastructures, which increases congestion on the main axis
- Different types of financial difficulties
- Related to Bajaj renewal: investment cost is relatively high due to import taxation.;
- Related to the cost of spare parts, due to the fluctuation of exchange rate

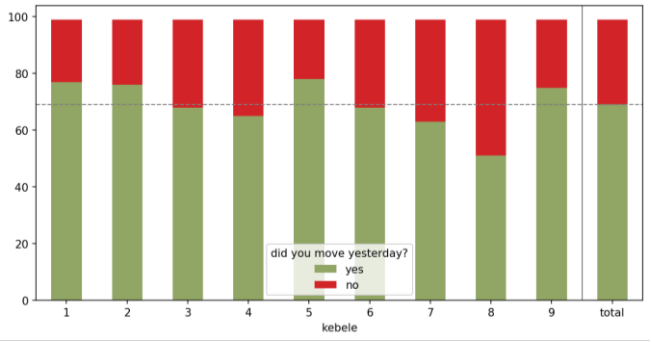
Related to the socioeconomic profile of Bajaj drivers: most of them are unemployed youth, who can hardly save money to upgrade their vehicle, possibly to get a 4-wheelers. They thus ask for preferred rates of loan;

A shortage of benzene that occurs at the beginning or end of the month and can be an impediment for the work of Bajaj drivers. This situation is partly related to the fact that the fuel price in Dire Dawa is lower than in the rest of the country. Therefore, freight transporters transiting through the City take advantage to stop by for refill.

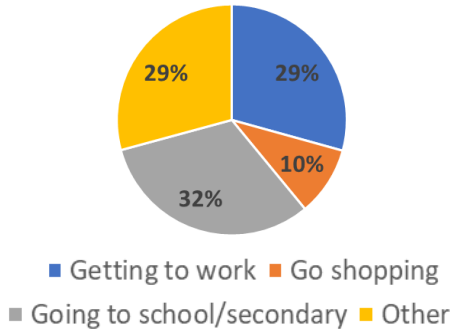
## 3.5.2. Mobility demand and traffic

### Mobility patterns

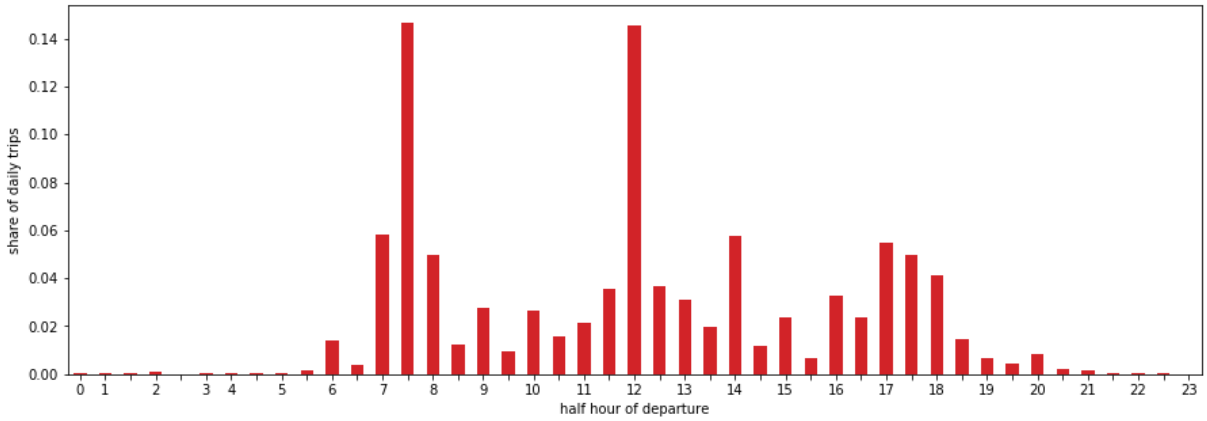
Mobility patterns reveal a relatively high propension to move (1.8 daily trips per inhabitants), with 40% of trips having non-constrained purposes like shopping. Trips are distributed over time according to a typical hourly profile marked by peak flows early in the morning and at midday, when employees go to work and then back home for lunch.




**Mobile population by kebele – source: Household survey, SYSTRA, 2020**




**Share of trips according to purpose – source: Household survey, SYSTRA, 2020**

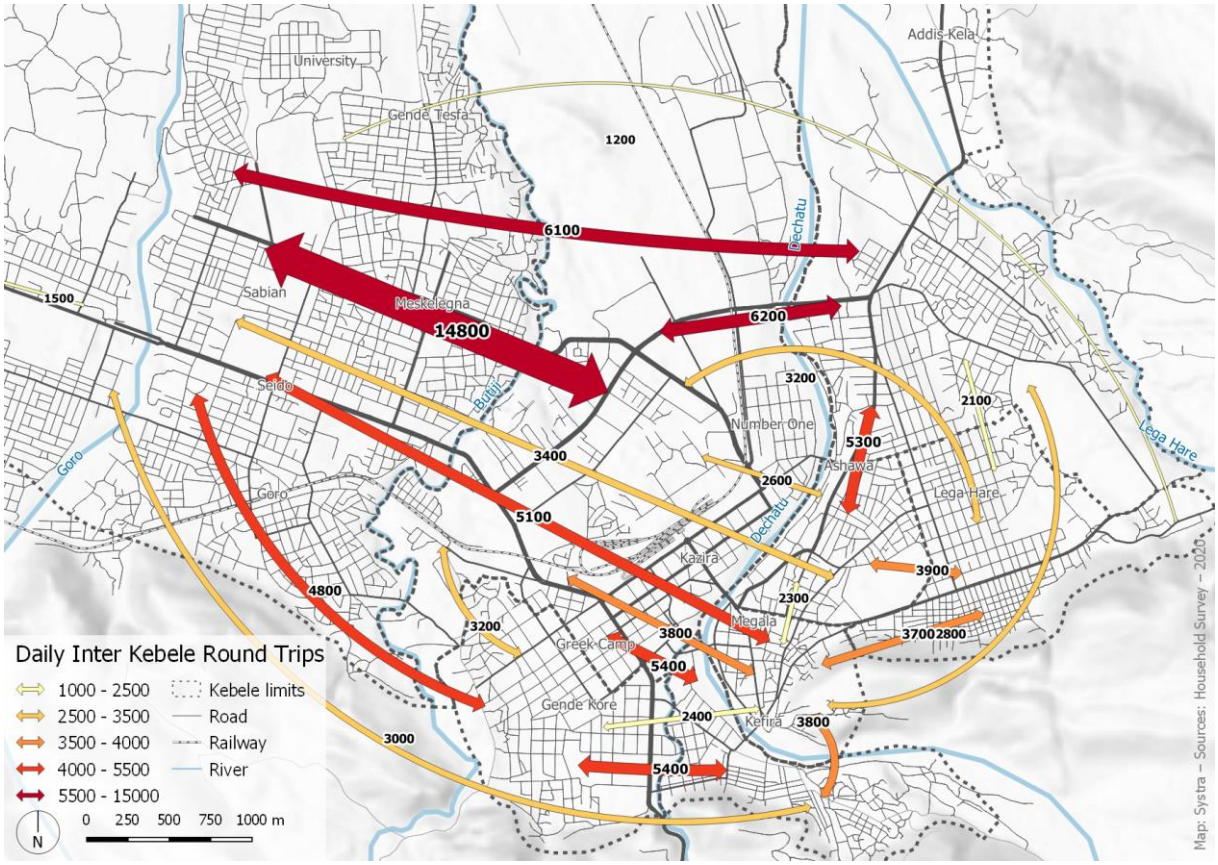



**Trips by departure time – source: Household survey, SYSTRA, 2020**

## Mobility flows

477 000 trips are carried out daily in Dire Dawa. Mobility conditions tend to restrain trips distance and duration:

- Regarding distance: most trips are internal to Kebele (about 60% of the total). Interactions between Kebeles reflect their attractivity and dominant land use. These factors condition the level of dependency of one Kebele to other parts of the city. In particular, a high level of interaction can be highlighted between Kebele 2 and Kebele 3, with 14 800 daily trips. On the other hand, the limited interaction of Melka Jebdu with the rest of the city illustrates how distance hinders people mobility.
- As for duration: one trip commonly last 15 minutes, regardless to the mode used. In 80% of the cases, it involves one single mode of transport (and also one vehicle, in case of a motorized mode);
- In average, Dire Dawa inhabitants dedicate 35 minutes and 7 BRR daily for transportation, thus travelling about 7.6 km in total.



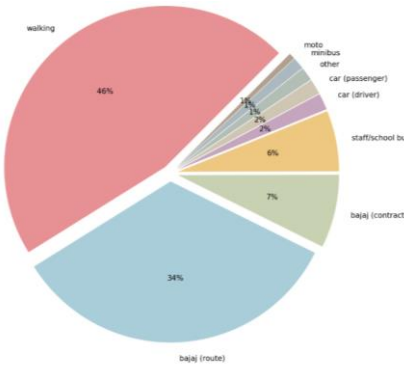

**Daily flows between Kebeles – source: Household survey, SYSTRA, 2020**

## Modal split

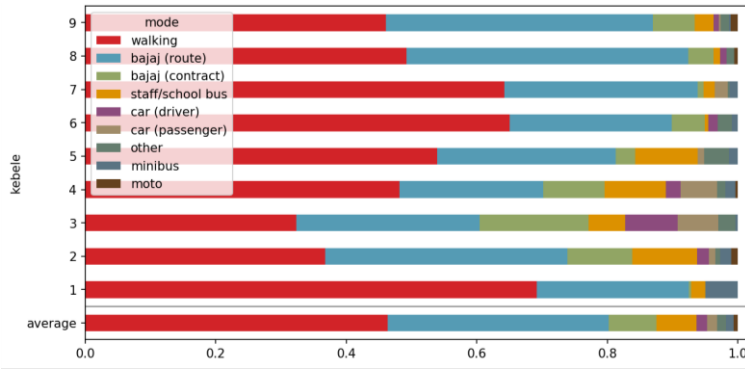
Motorization being marginal, mobility in the urban area mostly relies on walking (46%) and Bajaj (41%). The comparison of modal behaviours between Kebele sheds light on local conditions and constraints:

- The walking share varies in a large extent, from 30% in Kebele 3 to 70% in Kebele 1. It is to be related to the mobility pattern (the higher the share of internal trips, meaning trips of shorter distance, the higher the likelihood to walk) and to the availability of other options, including private one (car share in Kebele 3 is four time the average).
- The use of Bajaj also differs from one Kebele to another, according to factors that depend on the type of service. On one hand, the use of line Bajaj relies on the average distance to be travelled and the related need for a motorized mode. Thus, peripheral Kebele with an important share of external trips (typically Kebele 2, 8 and 9) have a high modal share of line Bajaj (around 40%). On the other hand, the use of Bajaj contract is correlated to the local willingness to pay . In that regard, Kebele 3 stands ahead with 17% of modal share for Bajaj contract, whereas it is null or close to zero in other Kebeles.

Inter modal trips are insignificant and connection rate for Bajaj mode is about 17%.




Modal shares – source: Household survey, SYSTRA, 2020




Share of mode per Kebele – source: Household survey, SYSTRA, 2020

### 3.5.3. Active mobility

## Walking

Walking is the first transportation mode in Dire Dawa with a measured modal share of 46% in the household survey. However dominant it may be, it can be considered as an "invisible mode" as it is mostly perceived as a non-choice of transport, as a forced alternative for lack of other affordable proposals or as an adjustment variable to get to other modes. Being invisible, it is supposed to adapt to any conditions without proper facilities. Sidewalks along the streets are uneven, if they exist at all, and their walkability is often much altered by alternative and competing uses (storage, trade, parking, etc.) Their lack of regular maintenance in the best-case hamper pedestrian flows and crowd them out on the road with the rest of the traffic in unsafe conditions.

However, according to the household surveys, walking still ranks second for the preferred mode with 14%, far after the private car (48%) but before public transports or more surprisingly the personal motorcycle. Indeed, walking is the cheapest and most comfortable way to move in the city, in comparison with other modes.

More broadly, there is currently no vision of a proper "walking network" as there is no vision either of walking demand. It is a major component of the mobility system that is eluded, for not being perceived and properly assessed as such. In that regard, the household survey provides an adequate tool to support a demand-based transport planning approach for walking.

Based on the household survey, first actions to improve walking conditions, and especially make it safer, are quite clear: it is about building sidewalks (37%) and clearing the way from trading activities taking place on the pavement (33%). Other actions proposed - referring to parking space, signage and traffic management - are quoted in second or third priority without specific highlight.

## Cycling

Bike perception is quite bad, including regarding speed: 30% of the household survey respondents find it very slow or rather slow, while 50% declared being not concerned. Accordingly, almost all respondents do not consider buying a bike. Climate and physical effort come as the first reasons for not adopting that mode. Safety also seems to be a concern: 16% named it as a first disadvantage while 21% mentioned as a second one the fact that it was stressful.

## 3.6. Accessibility

Availability and price of public transport (overwhelmingly Bajaj) are the two main drawbacks affecting people mobility as a whole, with respectively 36% and 21% of responses from the household surveys. Indeed, the accessibility to some public services or other primary functions are not guaranteed by the current public transport network.

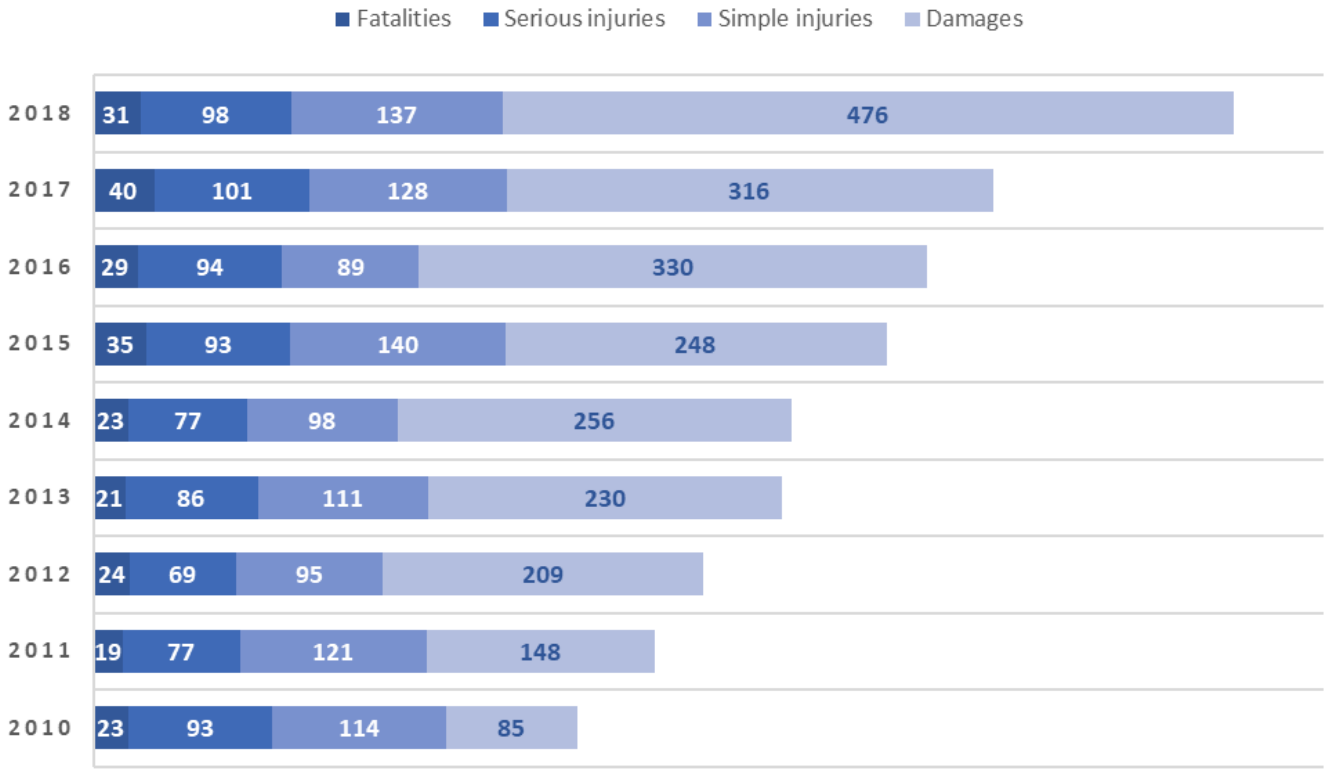
If Bajaj supply is abundant enough to fully fit with solvent demand, this purely liberal system is focused on main mobility needs whether in time (week base days, peak hours) or in space (main axes, main origin-destination pairs). Meaning that other needs are poorly or not addressed at all, leaving large chunks of demand unaddressed as they are considered as marginal or not solvent. Difficulties to get a free Bajaj result in long waiting time that affect the total trip duration. Fare levels can rise unpredictively for these types of rides. Adequation of Bajaj supply to demand is then partial and relies on financial return for Bajaj drivers rather than on service concerns.

Walking the first or last mile comes as the third most quoted drawback in the household survey (16%) underlining local connectivity issues.

## 3.7. Road safety

Since 2010, the number of road accidents has been steadily increasing. It found a peak in 2018, with more than 700 occurrences reported. However, the increase is mainly due to light accidents (damages only). The volume of fatalities or serious injuries remains constant over the period. Main causes for accident are the following:

- Drivers behaviour;
- Road users not using the space properly;
- Weather conditions, especially the heat that makes long distance drivers les cautious;
- Lack of working or coherent road facilities, such as traffic lights or signals;
- Road design, especially regarding intersections which are not necessarily dimensioned or managed according to the traffic;
- Second-hand vehicles as there is neither lifespan limit for vehicle nor effective technical control.




**Road accident statistics between 2010 and 2018 – source: FTA, 2019**

Most daytime accidents are not fatal and happen at low speed. They impact the traffic and generate congestion. Fatal accidents occur mostly at night or on non-working days (Saturday, Sunday or holydays) when the traffic is lighter, and drivers are likely to drive faster than usual. Some black spots are mentioned, especially on the main east-west road.

## 3.8. Urban freight

### 3.8.1. National and regional freight

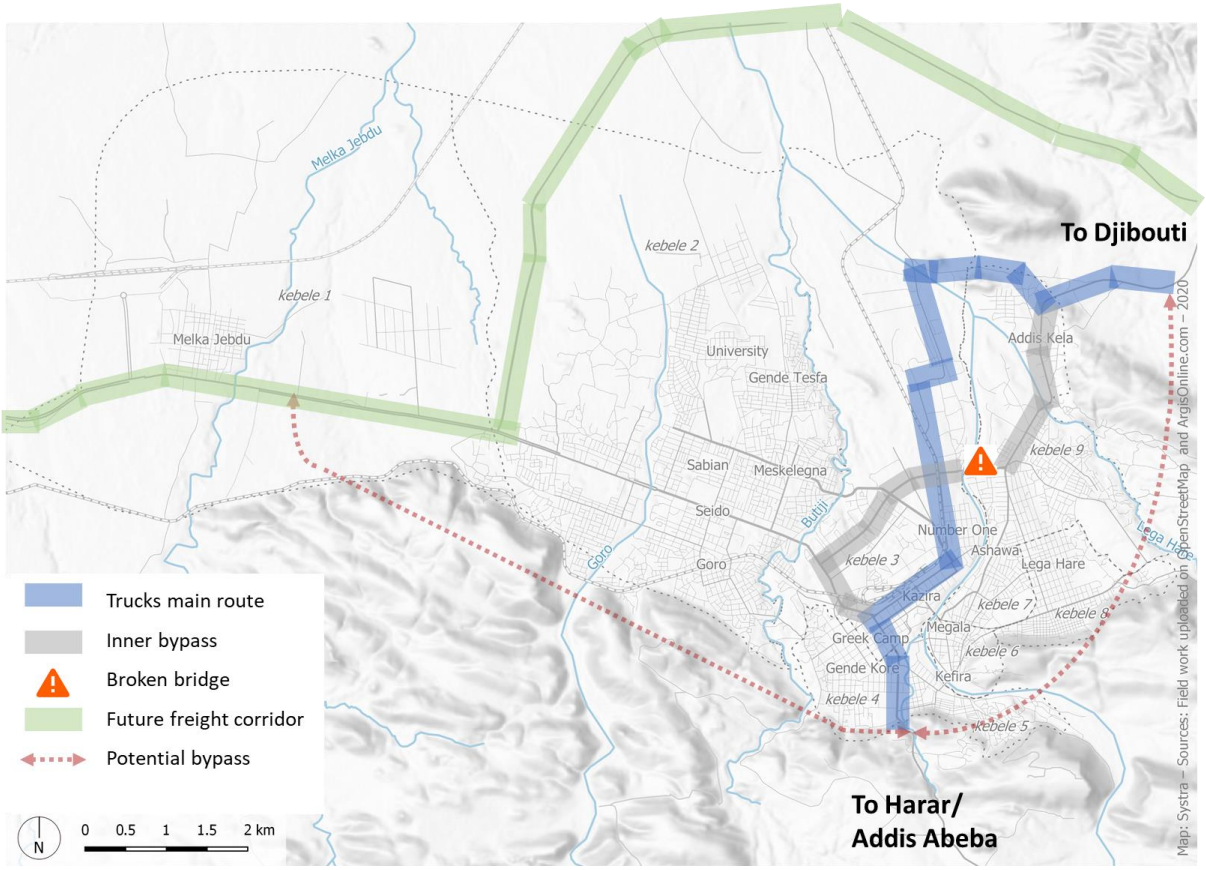
Dire Dawa is located on a secondary national/international freight corridor between Addis Abeba and Djibouti, meaning that a significant volume of trucks transits through the city. Dire Dawa is convenient halt for drivers to benefit from services and commodities located in the center.

| Route | Mode | Km / Time | Freight stations served |
|---|---|---|---|
| Addis Abeba– Kombucha – Mille – Djibouti | Road | 857 km / 15h | Kombucha, Mille, Semera |
| Addis Abeba– Awash – Mille – Djibouti | Road | 868 km / 12h | Debre Zeit, Mojo, Nazreth, Mille, Semera |
| Addis Abeba– Dire Dawa – Djibouti | Road | 831 km / 14h | Debre Zeit, Mojo, Nazreth, Dire Dawa |
| Addis Abeba– Dire Dawa – Dewele | Train | 756 km / 10h | Dire Dawa |

### Routes between Addis Abeba and Djibouti

National transit flows in Dire Dawa are not optimal as they do not take the outer bypass, for this transit route has no highway to connect to in the west and is as a consequence totally underused. Transit traffic in the Addis direction enters/leaves the city through the Harar road to the south east instead of taking the western road. This generates a number of constraints as traffics needs to transit through the city centre. The current trucks route through Dire Dawa is then constrained by the design of the network and condition of the road. In that regard, three points are outlined on the map hereafter:

- Discontinuity between the main road of Dire Dawa and the expressway to Addis Abeba, in Melka Jebdu;
- Missing link between the left and right banks of the Dechatu river;
- Discontinuity between the urban area and the Djibouti road, due to the poor condition of the link in between.




### National freight transit corridors through Dire Dawa[3]

Two railway lines currently serve Dire Dawa. The century old Ethio-Djiboutian railway is now nearly disused and only keeps one or two regional services between Dire Dawa and Dewele at the Djibutian border. The new Chinese built railway line between Addis Abeba and Djibouti is operating since 2018 and is increasing both passenger and freight services with a planned dry port near the new station.

[3] The broken bridge represented on the map has later been repaired in 2021.

Railway does not yet appear as a competitive alternative to road freight, but services are only beginning.

The century old Ethio-Djiboutian railway was the starting point of Dire Dawa. The new railway line and the planned completion of the highway route between Addis and Djibouti are about to give Dire Dawa a radically new scale of development for which the city has to get ready.

**Feedback from the business focus group**

According to the stakeholders gathered through the business focus group, factories tend to rely on contractors rather than on their own resources for inbound/outbound logistic. Transport of imported inputs from abroad is mostly outsourced. As for outputs, their customer are left in charge of the delivery of their products. Transport suppliers (by truck) are considered as not fully reliable, for supply does not always meet demand and as they care first for public command. Train supply is tested for some goods (cement) though marginally, as shift from road to rail and rail to road are needed at both ends. It is not seen as very competitive, due to the induced loading/unloading operations.

### 3.8.2. Urban logistic

Urban freight is vibrant in Dire Dawa because of the position of the city as regional trade centre and because of its production basis. Even if commercial activities tend to be spread all over the city, some areas stand out as important commercial poles in the city, especially Kefira and Ashawa (respectively in Kebele 6 and Kebele 7 & 9) as well as Seido in Kebele 2. It results in a concentration of different kind of feeding flows generated by these activities that notably contribute to congestion due to dense urban fabric and lack of regulation.

Transportation of goods is performed through different types of vehicles: small trucks, Isuzu type micro trucks, bajaj, horse carts or manpower. None of these flows are effectively regulated nor restricted regarding time, routes, or parking places which does increase the impact of urban freight over the general traffic. Besides, part of the deliveries is carried out directly on the side of the street, generating occupation of the pavement and additional disturbance and congestion. Shopkeepers consulted in a dedicated focus group underlined that the Law Enforcement Dpt. could take away the goods as such deliveries were not allowed, but also pointed out that no alternative solution was available for them.

*Horse drawn deliveries of a building site*

*Truck deliveries of a building site*


*Small delivery truck (Suzuki or Isuzu)*

*Street side deliveries in Djibouti road*

Main commercial poles generate trips from the whole city both for shopkeepers and clients. Their accessibility is then downgraded by congestion which affects their activity, both for reassortment /delivery and for shopping. Both shopkeepers and customers can limit or even avoid trips to the referred marketplaces. They may prefer less congested and thus more attractive areas to establish their business or run errands.

**Feedback from the shopkeepers focus group**

The focus group carried out with shopkeepers from Kebele 7 allowed to have some feedback on practical aspects of local urban freight.

Traders begin early around 6 am and depart their job location around 6 pm. Some are limited in their capacity to have other trips during the day because of congestion and thus stay in the vicinity of their shop and will be constrained to carry out other aspects of their business (reassortment, administrative or bank formalities, purveyor visit, etc.)
They use various means of goods transportation depending of the distance and volume. The below examples were given:

- Small trucks to carry clothes or shoes from Addis or Djibouti
- Isuzu micro-trucks to carry rugs, curtains or mattresses through the city,
- Bajaj, forces and horse carts for many purposes, including fresh goods,
- Manpower for short distance

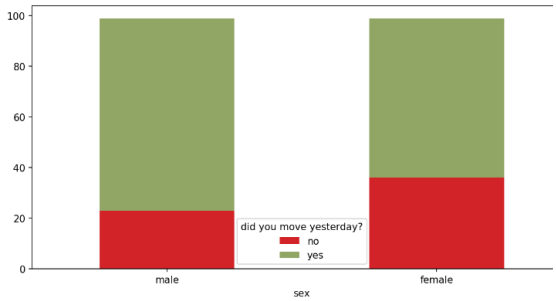
Part of the deliveries is carried out directly on the side of the street causing congestion and possibly losses of goods. the Law Enforcement Dpt. Can take away the goods as such deliveries were not allowed but no alternative solutions are available.

## 3.9. Social aspects of mobility

### 3.9.1. Gender and mobility

Because of their social path and role, women are more likely to be non-mobile than men. It reflects that in a large extent, women hold a different position in the household, and therefore carry out other activities, that induce specific mobility needs. Indeed, only 10% of the female population has a full-time job (three times less than male) whereas one third of them stay at home (within the male popu-

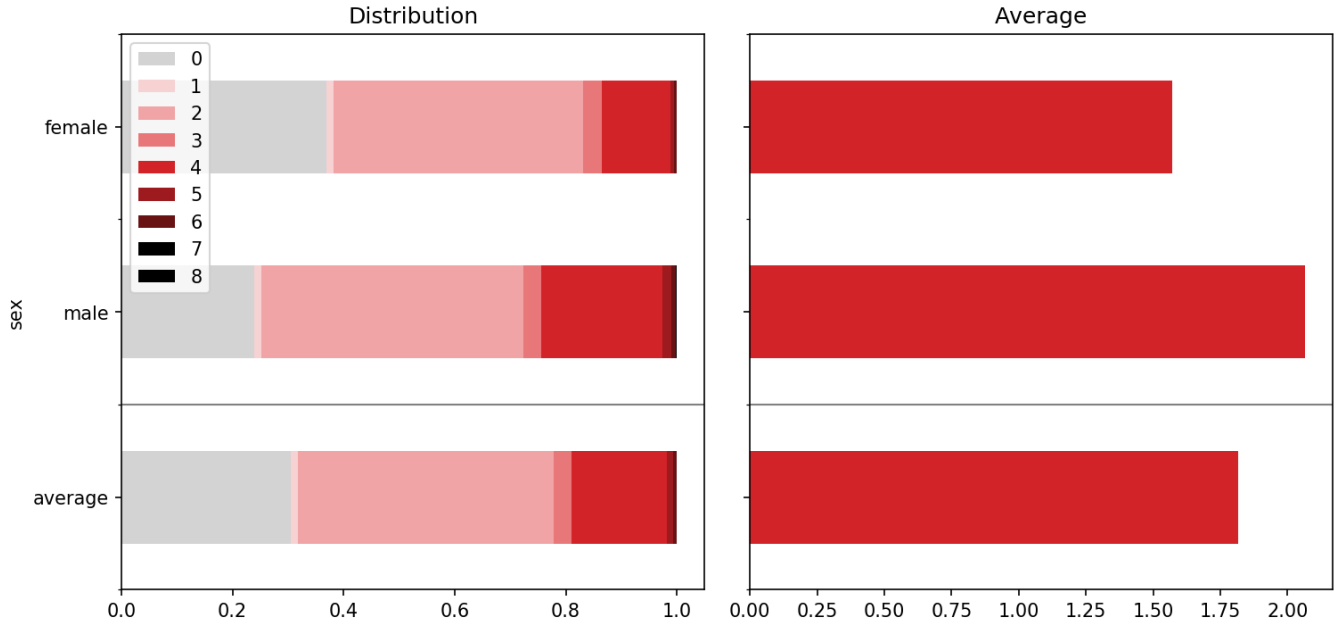
lation, that figures fall at 6%). Other occupations are similarly distributed within male and female population, indicating that the involvement of women into the workforce is the main gap and explaining factor for their mobility rate.




| | Female | Male | Total géné |
|---|---|---|---|
| annuity (pension, rent...) | 2% | 3% | 3% |
| full-time work - formal employment | 11% | 30% | 20% |
| learning, training, internship | 1% | 0% | 1% |
| other | 4% | 6% | 5% |
| part-time work - formal employment | 1% | 2% | 1% |
| retired | 2% | 2% | 2% |
| school graduated | 2% | 1% | 1% |
| stay at home | 33% | 6% | 19% |
| student | 38% | 40% | 39% |
| unemployed and/or looking for a job | 4% | 3% | 3% |
| work in informal employment | 5% | 7% | 6% |

**Mobile population according to gender (left), main occupation of respondents according to gender (right) – source: Household survey, SYSTRA, 2020**

Letting apart the fact that more women are not mobile, the mobility rate is not much different between mobile men and mobile women: 20% of the mobile women population realize 4 trips per day, while the figure is rather 30% within the mobile men population. Indeed, the share of the mobile women population realizing 2 trips per day is 10% higher than the mobile men population with the same mobility rate.




**Daily trips according to gender – source: Household survey, SYSTRA, 2020**

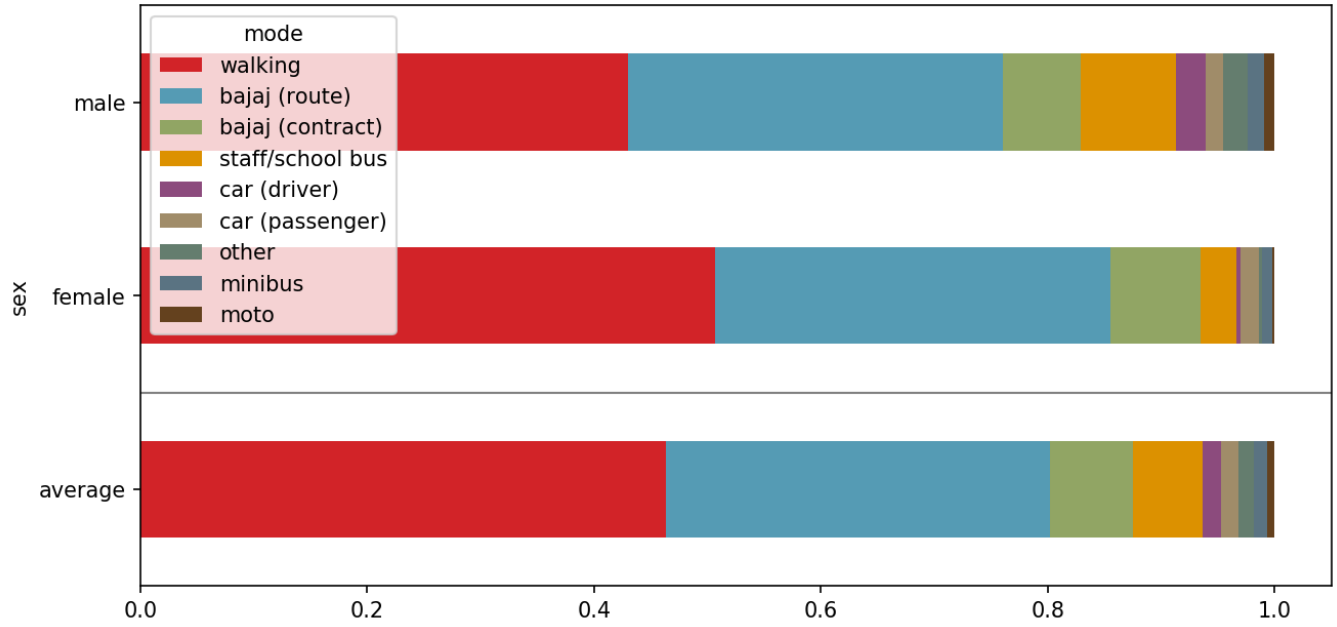
As a consequence of their lower mobility rate, women spend less time and money in transportation. More surprisingly, they tend to travel for notably shorter distances – two third of the average distance travelled by men. This may reflect a lower spending power or a tendency to carry out activities in the vicinity rather than in distant areas, due to the nature of the activity itself or the convenience it brings.

| sex | trips | distance | duration | price |
|---|---|---|---|---|
| female | 1.6 | 2000 | 30 | 5.8 |
| male | 2.1 | 3200 | 39 | 8.4 |
| average | 1.8 | 2600 | 34 | 7.1 |

**Mobility rate and associated data according to gender – source: Household survey, SYSTRA, 2020**

Compared to men, women are less likely to own a car, take a Bajaj or benefit from a staff bus. As a result, the walking share is higher among the female population. Indeed, the share of women mobilizing themselves for non-constrained purposes is more important. Therefore, they might consider walking more easily than men.

According to a focus group conducted with Bajaj users, high occupancy is reported as a disadvantage, regardless to gender. Indeed, female participants declared that promiscuity with men is not a problem as such, but the overload is.

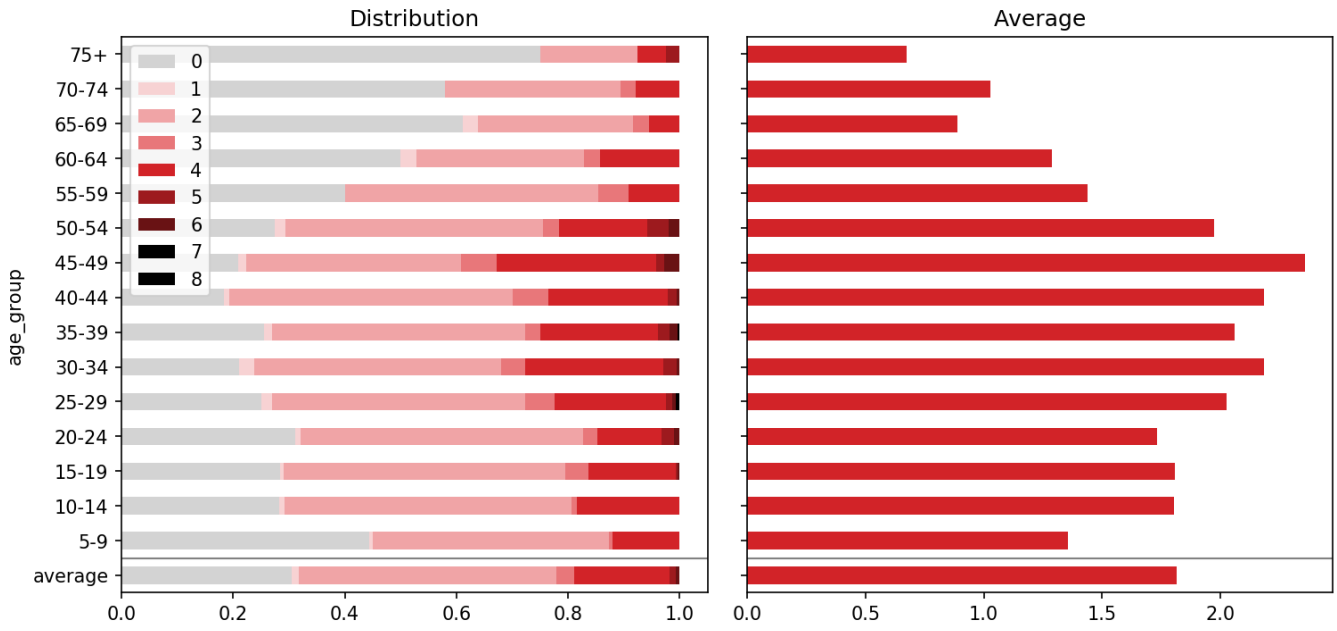



**Share of mode by gender – source: Household survey, SYSTRA, 2020**

## 3.9.2. Age and mobility

Three age classes can be distinguished according to mobility rate:

- Youth, or people under 25 years old have a mobility rate equal to average, except from the youngest (under 10) whose mobility is more limited (under 1.5 trips per day);
- Adults between 25 and 55 present a mobility rate above average especially the 45-49 fringe that realizes 2.4 trips per day (+30% compared to the average);
- Mobility of people above 55 years old is under average and diminish almost according to their age.




**Daily trips by age sgroup – source: Household survey, SYSTRA, 2020**

Dedicated price and time per day vary consistently with the previous observation, as detailed in the table hereafter. Indeed, there is little variation in the level of service between motorized trips.

| age_group | trips | distance | duration | price |
|---|---|---|---|---|
| 5-9 | 1.4 | 900 | 19 | 1.6 |
| 10-14 | 1.8 | 1700 | 32 | 2.9 |
| 15-19 | 1.8 | 2600 | 36 | 3.8 |
| 20-24 | 1.7 | 2500 | 32 | 7.0 |
| 25-29 | 2.0 | 3400 | 41 | 9.9 |
| 30-34 | 2.2 | 3700 | 43 | 10.2 |
| 35-39 | 2.1 | 3400 | 39 | 10.9 |
| 40-44 | 2.2 | 3300 | 43 | 13.7 |
| 45-49 | 2.4 | 4000 | 52 | 15.9 |
| 50-54 | 2.0 | 3600 | 43 | 10.6 |
| 55-59 | 1.4 | 2200 | 30 | 9.4 |
| 60-64 | 1.3 | 1800 | 28 | 5.8 |
| 65-69 | 0.9 | 2100 | 19 | 4.8 |
| 70-74 | 1.0 | 1600 | 25 | 5.0 |
| 75+ | 0.7 | 1000 | 14 | 2.6 |
| average | 1.8 | 2600 | 35 | 7.1 |

**Daily trips and associated data by age group – source: Household survey, SYSTRA, 2020**

### 3.9.3. Transport affordability

The typical household is formed by a family of 4 persons and is relatively wealthy compared to national standard (5 000 BRR -142 USD per household per month against 3 600 BRR- 103 USD on average in

Ethiopia). However, socioeconomic conditions are contrasted between Kebeles, Kebele 2, 3, 4, 5 and 9 being wealthier while Kebele 1, 6, 7 and 8 appear to be more vulnerable.

Mobility appears as a determining variable in households' organization as accounts for a relevant share of their budget (17%). At individual level, it represents 35 minutes and 7 BRR dedicated daily, as well as 7.6 travelled kilometres.

| | ***Dire Dawa*** | | ***Ethiopia*** | |
|---|---|---|---|---|
| | ***Average (2020)*** | ***Share*** | ***Estimate (2018)*** | ***Share*** |
| Monthly income of all household members | About 5 000 BRR | 100% | 3 600 BRR | |
| *Monthly total of expenditures* | *na* | *na* | *5 260 BRR* | *100%* |
| Monthly amount of the loan or rental | 1 000 BRR | 20% | 3 000 BRR | 57% |
| Monthly household budget for public transport | 850 BRR | 17% | 780 BRR | 15% |

**Average monthly income and main expenses per household – source: Household survey, SYSTRA, 2020 [Dire Dawa]; wageindicator.org [Ethiopia]]**

The latter can be related to the fare system of Bajaj, which is the main public transport in Dire Dawa. It also happens to be non-regulated and rather segregated on economic terms. Line based operated Bajaj are affordable for most passengers, but contract Bajaj are not, with a cost difference 5 to 10-fold between the two. This situation reflects rather strong differences according to passenger value of time. Contract Bajaj run like taxis and take rather quickly their well-off passengers directly to their destination. Line Bajaj on the contrary carry passengers with less means and less value of time as travel time is longer and less predictable, involving some waiting time and transfers to make a full trip. In the same line, night service is scarcer and comes to a higher price, festival day services have a higher price, both for shared Bajaj (e.g., from 2 BRR to 5 BRR) and for contracts (over 50 BRR sometimes).

The quality to cost of the service is then rather low, and Bajaj users have mixed feelings in that regard. According to the household surveys, revealed preferences confirm that contract Bajaj are very expensive for users, although 98% of them would accept a slightly higher fare for a better service. More specifically, participants to the focus group dedicated to Bajaj mentioned that drivers use to make their own price, due to the absence of regulation. They thus claim for more regulated prices should be implemented

### 3.9.4. City Liveability

City liveability is somewhat related to the pedestrian-friendly character of the City. It is therefore impaired by the same factors that impair walking conditions:

- The limited width of the pavement, when not absent: in many cases, walkways are narrow or obstructed by road cleaning wastes or trees,

- The occupation of the pavement for commercial activities: as a result of the lack of public space, pavement is commonly the place to display food or goods on sale, among other activities. The informal market of Seido is a typical example of such use of the walkway. Although it supports a vivid micro-economy, it presents many drawbacks such as the eviction of the pedestrians on the road and the filling of the drainage system with the wastes from the market;
- When consisting in an open trench, the drainage system itself is a mobility impediment, especially for physically challenged people.

*Sidewalk occupied by commercial displays, vegetation and building, thus preventing continuous pedestrian route*

*Dumps on the pavement and pedestrian on the road (East-West road)*

*Narrow and obstructed pavement in Kezira*


*Factory entry on the East-West road, no sidewalk is found*

*Pavement works in progress (East-West southern road). Sidewalks are taken into account in new road projects.*

Conversely, walking is somehow facilitated by the topography and the shape of the city. Lying in a mostly even plain, urban layout is mostly continuous, though not compact, and well irrigated by a dense road network shaping urban blocks of rather small size. The generalized presence of rows of trees along the streets giving shade and somehow regulating temperatures is another positive factor. Overall, these features participate to the city liveability, as they allow for a fairly good and homogeneous accessibility to any place in the city, including for pedestrians.

The particular case of informal settlements should be mentioned, as their living conditions are significantly downgraded. They represent about 17% of the inhabitants and 19% of the city surface. They are

mostly encountered in Boren, Goro, Gende Gerada, Genderige, Mermesa GTZ and Mudi Aneno[4]. They can be reached through few dirt tracks or even stairs cut in the stone when located on the slopes., Accessibility of these neighbourhoods can then be severely hampered during rainy season, for paths are likely to be destroyed. Fresh informal settlements do not benefit from any utilities apart the ones built by the inhabitants themselves. Generally, utilities come later on as settlements are slowly regularised through the actions of public authorities (water, sewage) or utilities providers (e.g. electricity). Some collective action can be taken through local associations to speed up their implementation (e.g. digging of culverts).

*Informal dwellings scattered on the slopes overlooking Goro district under construction (left) and constructed (right). These small block houses made of cement blocks are rural types of habitat brought to the city.*

As for safety, it can be highlighted that:

- 14% of the household survey respondents, that also happen to use Bajaj expect an improvement of the road safety. A smaller share quoted dedicated waiting spaces on the road as an expected improvements.
- City Bus are perceived as safer than Bajaj, according to qualitive surveys, but much slower due to dwelling time at each station.
- Khat market and more generally Lega Hare get dodgy between 12 and 2 due to khat consuming, as expressed by participants to the focus group dedicated to non-motorized modes.

## 3.10. Environment

### 3.10.1. GHG emission data and analysis

The method used to calculate the carbon impact of the formulated mobility vision is compliant fully compliant with the approach recommended by MobiliseYourCity (ASIF method). Activity data from the household survey have been considered, jointly with energy consumption and GHG conversion factors

[4] Source: Housing development strategy study report, 2019

estimated according to existing literature and local references. The resulting evaluation thus accounts for the mobility of Dire Dawa inhabitants.

Fuel consumption and GHG conversion factors are preferably extracted from an Ethiopian official source (MOT, 2013), although Bajaj data results from a review of literature.

| Mode | Emission factor per litre (kCO2eq/L) | Consumption (L/100km) | Emission factor per km (kCO2eq/km) | Source |
|---|---|---|---|---|
| **Bajaj** | 2,40 | 5 | 0,12 | WRI, 2015[5] |
| **Minibus** | 2,42 | 15 | 0,363 | MOT, 2013[6] |
| **Bus** | 2,68 | 20 | 0,536 | MOT, 2013 |
| **BRT** | 2,68 | 35 | 0,938 | MOT, 2013 |
| **Car** | 2,42 | 8 | 0,1936 | MOT, 2013 |

CO2 equivalent emission factors per mode

**E-mobility in Dire Dawa : the point of view of Bajaj association**

According to Bajaj associations representatives, electric vehicles are not trusted by the drivers, for the electricity supply can be scarce and the cost of spare parts can be high. Electric motorcycles have been tried in the past, but battery went out of order after 2 years of operation, due to spare part issue and damage caused by the heat.

As a matter of fact, electricity supply is not fully reliable with regular power outages that tend to damage electric devices operating on battery. However, the energy mix is almost totally renewable with 89% of hydroelectricity and 8% of wind power.

### 3.10.2. Air pollution

Fuel quality is currently quite poor in Dire Dawa and limits the motorization evolution to the EURO 3 norm due to the catalyst converter. The Integrated Green Economy Implementation Plan of Dire Dawa recommends setting an emission standard, a limited service year on imported vehicles and to encourage imports of new vehicles (including hybrid and plug-in electric vehicles).

[5] India specific road transport emission factors, India GHG program, WRI, 2015

[6] Experience in measuring transport emissions, Ministry of Transport, 2013

# 3.11. Baseline

## 3.11.1. Ongoing and planned projects

### Road projects

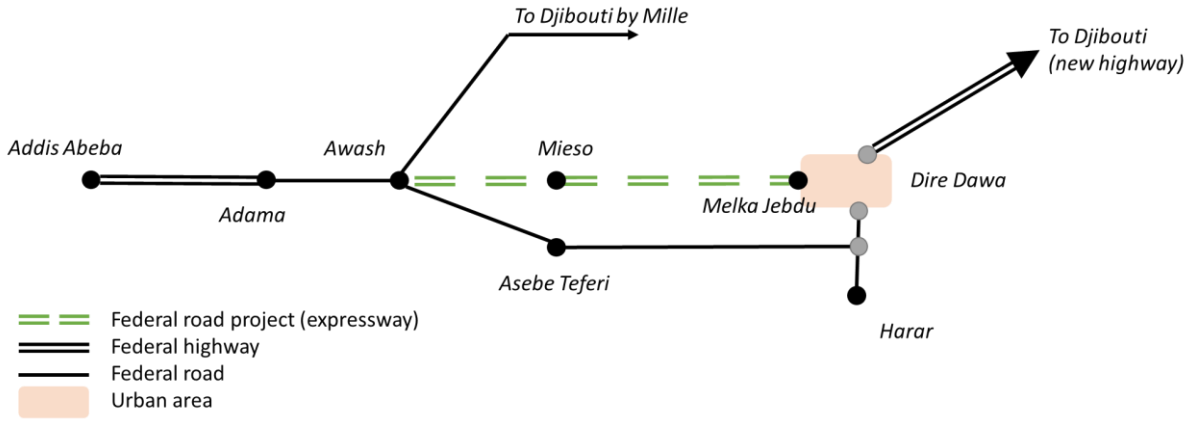
At national level, the planned expressway from Dire Dawa to Addis Abeba will bring significant time savings (about 6 hours) and will therefore totally reorganize traffic to Dire Dawa and further to Djibouti. It is supervised by the Ethiopian Road Authority (ERA) and is currently under design, though tender phase has been suspended. The project falls in three phases/sections: Addis - Adama, Adama - Awash and Awash - Dire Dawa.

This expressway project is to improve Dire Dawa overall connectivity and attractivity and will connect to the recently opened toll highway from Dire Dawa to Dewele, delivering a fully upgraded route from Addis to the Djibouti border.

The expressway has been anticipated at local level with:

- The extension and enlargement of the East-West Road (Seido - Melka Jebdu - new station - new industrial park). Construction works have been suspended in Melka Jebdu, as resettlement agreements are still being negotiated to have the road go through. Construction has been undertaken by the ERA while the City is responsible for land clearance.
- The northern bypass connecting the East-West Road to the Djibouti road (yet implemented);
- A southern bypass from Harar road (slaughterhouse) to Melka Jebdu (contracted)

Once the expressway implemented and the East-West Road completed through Melka Djebdu a full new transit route will allow to divert freight traffic from the city centre and to alleviate the latter from traffic impacts.



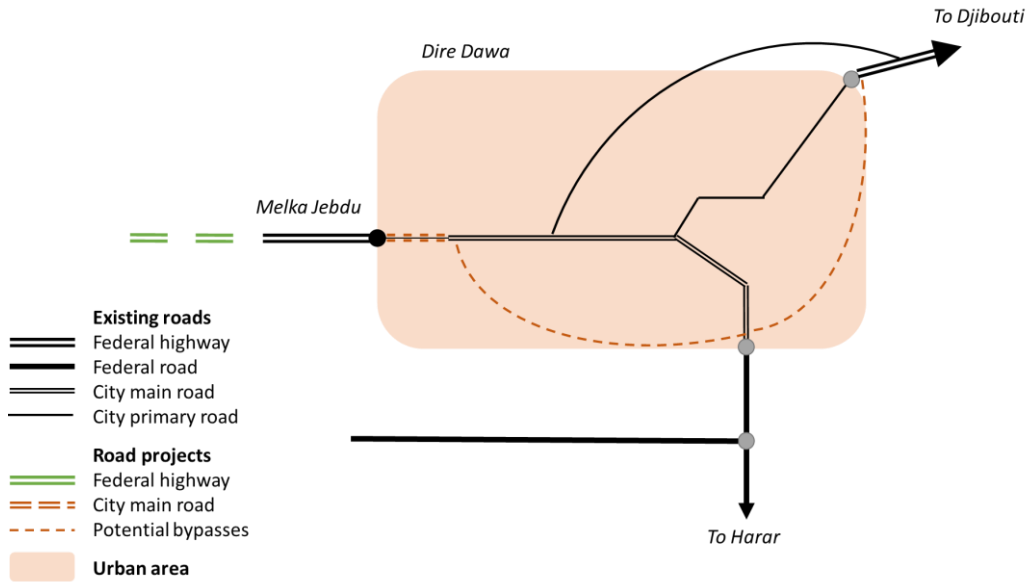

Schematic view of the projected roads at national scale

At local level, three additional links have been contracted:

- A north-south road going through Gende Tesfa and Meskelegna that connects with the northern bypass;

- Another north-south road going through Hamdael industrial park that connects with the northern bypass;
- An eastern bypass connecting the Christian cemetery to Djibouti road by Kebele 9.

In addition to the bypass roads previously mentioned, an eastern bypass is considered that would form a full ring along the extended city boundaries, thus linking the existing road to Djibouti to the existing road to Harar. Nonetheless, the relevance of these additional bypasses does not seem much grounded as the northern bypass would assume most of the transit flows.




Schematic view of the projected roads at local scale

## Public transport projects

No major transport project is planned in the city. The east-west road is considered as a potential back-bone for a public transport network, with a reservation for mass transit left in the median in its extension to the west.

## Freight projects

Freight terminals /dry ports are planned outside the city along with a new expressway to Addis Abeba connected to the east-west road and the northern city bypass. Upgraded roads on the Addis-Djibouti route would radically improve the global attractivity of Dire Dawa, foster freight transit and improve mobility conditions within the city with dedicated transit routes.

## 3.11.2. SWOT analysis

| | STRENGHTS | WEAKNESSES | OPPORTUNITIES | THREATS |
|---|---|---|---|---|
| ***Urban structure*** | ▪ A concentrated and continuous urban fabric for most districts with no major urban sprawl<br>▪ No major interruptions in the urban fabric, apart from the rivers and a few master blocks (e.g. Depo Mariam, University)<br>▪ A mixed land use in many districts, featuring industrial, artisanal and commercial activities, located both in the centre and the outskirts<br>▪ A recently built (from early 20th century on) and partly planned city, whose parcelling and road frame rather properly support urban functions and urban development.<br>▪ A level of urban density that allows the provision of a viable and efficient public transport supply | ▪ Some urban fabric dissection induced by rivers and few bridges / wades to cross them<br>▪ Some master blocks hamper mobility (military field by the old train station, University, Sabian hospital and Sabian bus station)<br>▪ A strong shortage of housing supply favouring the development of informal dwellings and unplanned areas,<br>▪ a concentration of economic activities and dense urban pattern in downtown (Kefira, Ashawa) generating conflictive mobility flows<br>▪ Scarce public spaces (e.g., side street pavement), altered by improper use and private appropriation | ▪ Potential for urban densification and development in the northern part of the city in continuity with central areas as a sustainable way for the city to grow<br>▪ A cleared expansion front to the west, towards Melka Djebdu that allows the city to develop according to plan in continuity of the existing urbanised areas,<br>▪ A strengthening of the city strategic position at national and international level thanks to newly constructed or projected road (newly implemented highway to Djibouti, planned highway to Addis) and new rail connections to Addis Abeba and Djibouti | ▪ A very extensive urban development strategy, possibly leading to urban sprawl, discontinuous urban fabric and distended urban poles, which would not be sustainable transport wise<br>▪ Informal developments on foothills, whose future integration into the urban fabric and connection to urban facilities are challenging |
| ***Mobility demand*** | ▪ A good level of revenue according to national standards (40% above), enabling people to be mobile and to choose their transport solution to some extent, possibly according to the quality of service<br>▪ A young population, with an important tendency to walk<br>▪ Low ownership and low use of private cars (2% of trips according to the HS) | ▪ High unemployment (24% in 2015) and low financial resources for this part of population limits its capacity to be mobile and increases the weight of transport expenses in the household budget | ▪ A solvent demand, that could contribute to financial balance of a public transport system<br>▪ A favourable context trend towards densification and a public transport-oriented pattern, which is to optimize the use of infrastructures (population growth coupled with a limited urban sprawl) | ▪ A spending power that may foster car ownership<br>▪ Some urban development trends could stretch demand |

| | STRENGHTS | WEAKNESSES | OPPORTUNITIES | THREATS |
|---|---|---|---|---|
| ***Transport supply - infrastructures and their use*** | ▪ A globally fair coverage of the city by a hierarchised urban road network<br>▪ an overall fair condition of the urban road network. First level roads are homogenously asphalted and are maintained in fair circulation conditions<br>▪ Maintenance works are carried out regularly for the main roads<br>▪ The generalized use of cobblestone for local road surface stands out as a sustainable, easily maintainable and locally sourced material | ▪ An unbalanced road network with a limited number of first level roads that concentrate traffic and generates congestion<br>▪ A distended and not always continuous pattern of first level roads<br>▪ Some inadequacies between the level of some roads and their profile, creating mismatches with their functions<br>▪ A limited number of bridges generating some partitions between different areas and concentrating traffic on a limited number of bridges. For instance, the Dechatu is rather crossed by wades (4) than bridges (2, one being out of order).<br>▪ local roads can have discontinuous and poor road surface and have little maintenance. Non-surfaced roads can commonly out of use when it rains<br>▪ Discrepancy between the good theorical capacity of roads and their effective congestion due to unregulated and inefficient traffic conditions as well as to the coexistence of many antag- | ▪ The former railway line is disused from the station in the western direction and has a potential for mobility development (new relations, alternative mobility support, etc.)<br>▪ The strategic, position of Dire Dawa on road and railway networks, both at regional and national scale<br>▪ A significant potential to optimise road capacity on the current base and to limit congestion through a reorganisation / regulation of different road uses<br>▪ The current northern bypass is blatantly underused because no alternative connection to the existing one (through Harargue mountains) to Addis is yet implemented, though being planned (highway). | ▪ Severe climatic conditions implying additional requirements over transport infrastructures<br>▪ In case of maximalist urban development associated to urban sprawl and low densities, risk of increased length of road infrastructure with associated increased investment and maintenance costs<br>▪ Some road bypasses projects west and south of Dire Dawa do not seem well grounded as the northern one still has to used up to its potential. They could divert investment from more useful purposes. |

| | | | | |
|---|---|---|---|---|
| | | onistic uses (commercial activities, Bajaj regulation, pedestrian flows, etc.).<br>▪ General lack of efficient traffic regulation generating congestion, especially at junctions and during peak hours, because of conflictive uses<br>▪ freight transit routes are currently running through the city as all thru traffic coming/going to Addis needs to cross the city (Harar road) | | |
| ***Transport supply – transport services and their use*** | ▪ Abundant and flexible Bajaj supply matching most important mobility needs especially in peak hours and on main routes<br>▪ A passenger transport sector that significantly contributes to local economy and employment | ▪ A fully private and liberal system that needs to break even on financial grounds and focuses on the main profitable market segments<br>▪ Fares are regulated by supply and demand and drivers want to maximise their profit. Fares level are not regulated and can vary according to demand. Contract are preferred to line services whenever possible, especially in peripheral areas and out of main travelling times.<br>▪ Some demand segment deemed as unprofitable are left aside (out of main travel times and travel flows)<br>▪ This unserved demand is neither visible nor addressed as opposed to properly planned public transports, | ▪ Bajaj supply is agile and able to quickly adapt to changing transport pattern, such as the introduction of more structured supply (bus, MRT)<br>▪ Some demand segments are not yet fully addressed by current transport services to be developed to address minor mobility needs<br>▪ | ▪ Public financing capacity limits the potential development of subsidised forms of public transport, leaving a significant economic constraint over the development of alternative forms of transports<br>▪ Remote urban developments could push the current transport system to a breaking point as increased distance would not allow to have the current level of affordable fares |

| | | | | |
|---|---|---|---|---|
| | | ▪ The transport system is an important job provider with a social and economic weight to be considered with caution in potential adjustments | | |
| | **STRENGHTS** | **WEAKNESSES** | **OPPORTUNITIES** | **THREATS** |
| ***Governance*** | ▪ A clear and consistent organization of institutional bodies and according competences<br>▪ Relevant planning capacities and culture, whether for urban or mobility aspects, as well as availability of relevant resources and tools (land use and parcelling GIS)<br>▪ A sensitivity to public acceptance, consultation, and a will to adopt inclusive development<br>▪ A good capacity to implement efficiently IFIs development programmes with local resources | ▪ Difficulties to deal with land entitlement issues, that can slow down or jeopardize major projects implementation<br>▪ A need for an operational framework supporting the provision of serviced land and (affordable) housings to limit the development of informal housing and urban development<br>▪ A shortage of resources to carry out maintenance, especially on local roads<br>▪ A coordination to be improved between the federal and the local governments | ▪ An existing planning unit, able to follow-up and evaluate the SUMP of Dire Dawa<br>▪ Local capacity to negociate and implement relevant development programmes with national authorities and/or IFIs | ▪ A major urban development planed by the federal government west of the city, with no proper articulation with planned development at local level nor assessment of impacts at local level |
| ***Finances*** | ▪ A balance budget of the City with identified resources and well followed up over the years<br>▪ IFI (World Bank) complementary support in the implementation of urban basic facilities and services | ▪ Limited capacity to secure funds caring for the needs for infrastructure investment and maintenance<br>▪ A road maintenance budget that does not fit the needs (mainly the Road Fund allocated by the Federal Government)<br>▪ A reduced base for local taxation that limits investment and maintenance capacities | ▪ Potential fiscal resources to support development investments given the economic weight of the city and its position on existing and future transit routes | ▪ Disjunction between investment and operation funding capacities, considering foreseen development trend and the increase of the assets belonging to the City |

| | STRENGHTS | WEAKNESSES | OPPORTUNITIES | THREATS |
|---|---|---|---|---|
| ***Planning and projects*** | ▪ Several generations of urban masterplan whose implementation has contributed to shape the city<br>▪ A dedicated unit within the City Administration (Project Office)<br>▪ A number of development projects have been carried out | ▪ Absence of existing transport planning besides some studies<br>▪ Difficulties to implement and follow-up objectives of previous urban master plans<br>▪ Capacities to have adequate resources to maintain previous projects can be limited | ▪ Development of a new city (New Industrial Park) starting from a few industrial sites and planned as a mixed urban pole | ▪ The New Industrial Park, as a remote extension of the city that may cause a change in scale, requiring strong investments to provide services and adapt the transport system over the extended perimeter<br>▪ Lack of integration of the new industrial park and housing development with currently planned development of the city<br>▪ risk to have an overextended city lacking of integration on urban and mobility aspects: development poles distant from one another, underdeveloped areas included in the city, long infrastructures to be built and maintained, long internal trips. |
| ***Environment*** | ▪ An existing framework that sets objectives and propose measures as well as an estimated budget and monitoring indicators for some of these, aligned with the national strategy | ▪ No clear breakdown of the current carbon footprint according to sectors<br>▪ Considered measures are focused on transport supply and vehicle technology | ▪ The 2020 household survey, as a basis for the establishment of a reference carbon appraisal, for the transport sectors | ▪ A weak understanding of the freight traffic generated locally and related carbon footprint |

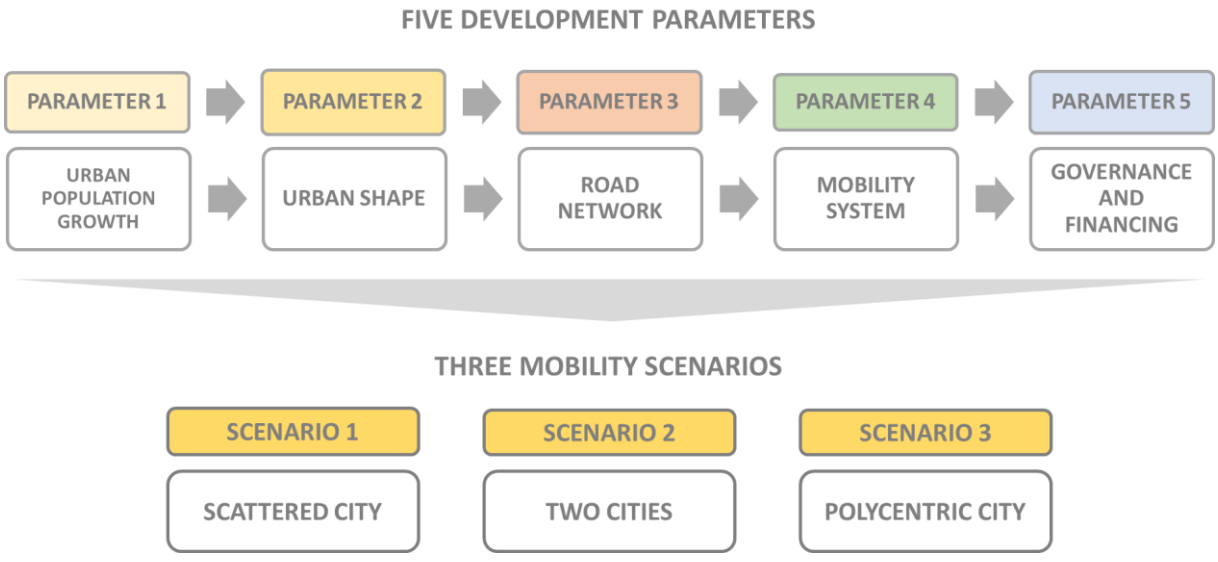
# 4. Vision and objectives

The aim of this phase is to develop a prospective vision of the mobility of Dire Dawa on the long term on a 20-year prospect up to 2040.

Even if the SUMP operational scope of intervention is foreseen on a shorter prospect, this prospective approach allows to integrate it in a broader vision to provide a wider understanding of its outcomes. It is conducted step by step in order to share and make clear the different choices leading to the definition of the Dire Dawa 2040 mobility vision:

- **development parameters** are identified to understand mobility drivers and to give a 360° understanding of city development: demographic aspects, economic development urban development and urban shape, infrastructure and transport supply, city governance.
- From the variation of these parameters, contrasted **prospective scenarios** are built up. They present contrasted pictures of different possible futures, more or less desirable, but all feasible and likely to happen. They can identify: current trends to expand or to fade, possible emerging trends to surge in the future, weak signals of possible future key future trends / phenomenon, breakthrough aspects being possible future knots turning the situation upside down.
- These scenarios are then assessed and compared in cooperation with the stakeholders to define the **target prospective vision**.

From the 2040 mobility vision, the ambitions and objectives of the SUMP are defined in order to give the guidelines that will allow to come from the current situation to the targeted one.




five development parameters generating three mobility scenarios

## 4.1. Five development parameters

### 4.1.1. parameter 1 - urban population growth

Urban population growth is a key factor to estimate the foreseen population of Dire Dawa in 2040 and therefore its induced level of urban development. Considering a steady overall demographic and urban transition, urban population growth has been appreciated according to the trends observed over the last decades as well as from projections established locally by the City Administration (for the City perimeter) and by Federal authorities (for the New Industrial Park).

No variations are considered for this parameter. Population in 2040 is the same for all scenarios. Future population is estimated for the Greater Dire Dawa, an area encompassing both:

- Dire Dawa City, that fits with the global trends,
- The New Industrial Park (NIP), which population would be fuelled by both urban and rural area, meaning that part of the urban growth would be captured by the NIP;

Regarding Dire Dawa City itself, the population at future horizons is estimated according to the following assumptions:

- A 4% annual growth rate ;
- A baseline population that includes the floating population, as estimated in 2018 by the Project Office.

The resulting population forecast for Dire Dawa urban area is detailed below.

| | 2018 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| **Urban population including floating population** | 319 500 | 418 600 | 489 400 | 607 900 | 755 100 |
| **Net increase of population compared to 2018** | - | 99 100 | 169 900 | 288 400 | 435 600 |

Projections for the urban population of Dire Dawa city

Regarding the NIP development, the population density assumed by 2040 is 6 000 inhab./km². Consequently, the foreseen population by 2040 is expected to reach 120 000 inhabitants in the NIP. Besides, considering recent demographic patterns, it is considered that about 10% of the urban growth could be reasonably captured by the NIP. The table hereafter presents the total population per scenario and per area in 2040.

Overall, the anticipated population for the Greater Dire Dawa would approach 835 100 inhabitants.

| | Scattered city | Two cities | Polycentric city |
|---|---|---|---|
| **Dire Dawa City** | 715 076 | 655 076 | 715 076 |
| **New Industrial Park** | 120 000 | 180 000 | 120 000 |
| **Total Greater Dire Dawa** | 835 076 | 835 076 | 835 076 |

2040 population for the three development scenarios, per area

### 4.1.2. parameter 2 – urban shape

Population in 2040 (parameter 1) is common to all scenarios, but its repartition within the Greater Dire Dawa area is not and is a major distinction between them. Urban shape (parameter 2) is therefore a strong variating parameter defining contrasted features and organization of the urban area in 2040. The urban shape results from different factors:

- The level of densification of existing urban areas
- The level of land opening to urbanization (city extension)
- The type and density of newly urbanized areas (density of extensions)
- The city overall layout and zoning (how the different areas match and mix together) as well as the continuity or discontinuity of the urban area
- The territorial organization (how the different areas interact and complement each other). E.g. the existence of polarities and the way they structure the urban space (rank and level of dependence). Its consistency impacts the ability of inhabitants to perform their activities within short distances. The number of polarities, their service basis, their density and the relations they have altogether can draw very different organization patterns in the city.

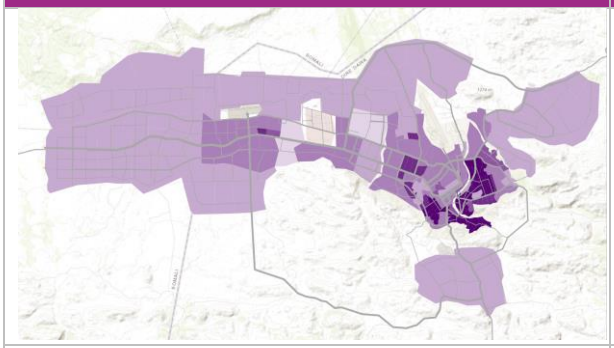
The variation and combination of these various factors into specific scenarios do not only shape the city but also induce contrasted types and levels of mobility demand, thus also impacting road infrastructure development and transport services. In turn, the latter also contribute to urban layout and to the attractivity of the urban polarities.

Scenarios have each their own pattern and intensity of urban development and associated density. Resulting population distribution is detailed hereafter.

| | Scattered city | Two cities | Polycentric city |
|---|---|---|---|
| ***Existing urban areas*** | 328 400 | 377 490 | 377 490 |
| ***Emerging urban areas*** | 26 920 | 119 210 | 123 470 |
| ***Interstitial areas*** | 76 560 | 36 000 | 60 000 |
| ***Opened areas*** | 283 200 | 122 380 | 154 120 |
| ***New Industrial Park*** | 120 000 | 180 000 | 120 000 |
| ***Total population*** | **835 080** | **835 080** | **835 080** |

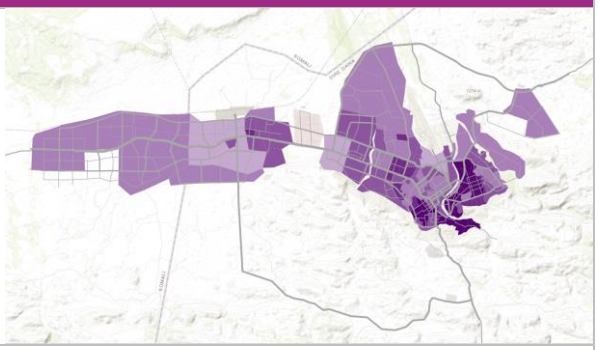
**Population distribution per scenario and macro zone, in 2040**

## Scattered city



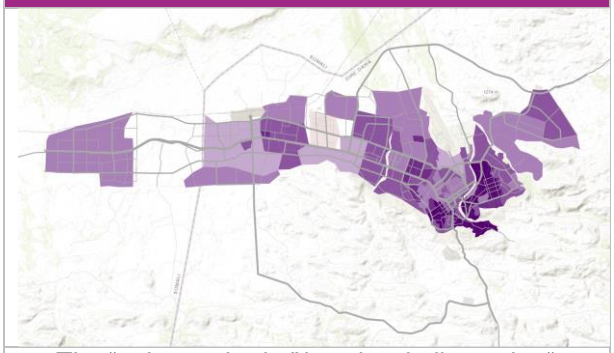
- The scattered city outstands by the footprint of the newly urbanized area, that is four time the size of the current urban area, thus covering almost the totality of the SUMP perimeter.
- Consequently, population density is rather low, whether in the new settlements or in the Greater Dire Dawa as a whole. In average, it is about half the density of the base year (2018).
- 141 km² urbanized land
- 94% of the whole urban area
- 5 900 inhab./sqkm

## Two cities

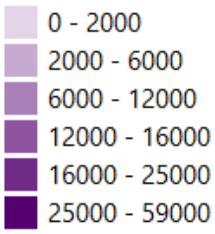


- The footprint of the “Two cities” urban area is half the one of the scattered city, with a relation between the existing urban area and the newly urbanized area that is about 1.5. As a result, the population density of the Greater Dire Dawa remains close to the average density in 2018.
- 75 km² urbanized land
- 50% of the whole urban area
- 11 100 inhab./sqkm

## Polycentric city



- The “polycentric city” is quite similar to the “two cities” scenario in terms of footprint and average population density. Only the distribution of the urban polarities differs. They are contiguous in the “polycentric city” and dichotomous in the “two cities” scenario.
- 68 km² urbanized land
- 46% of the whole urban area
- 12 300 inhab./sqkm

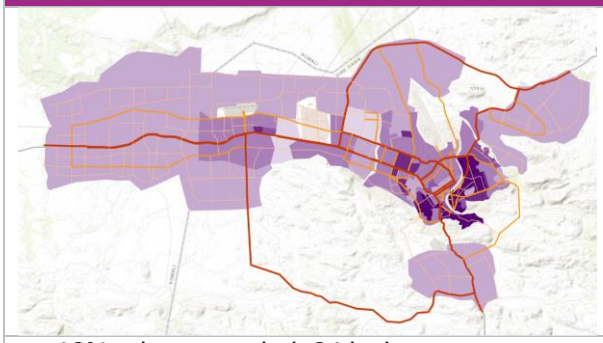
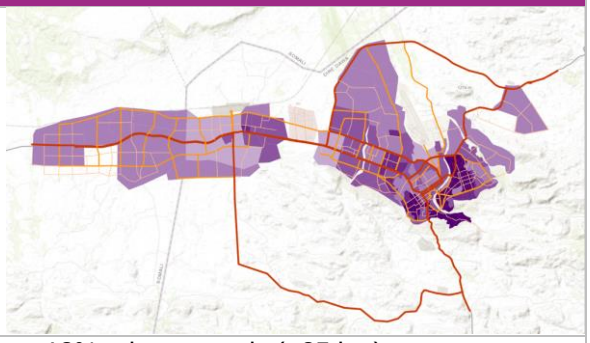
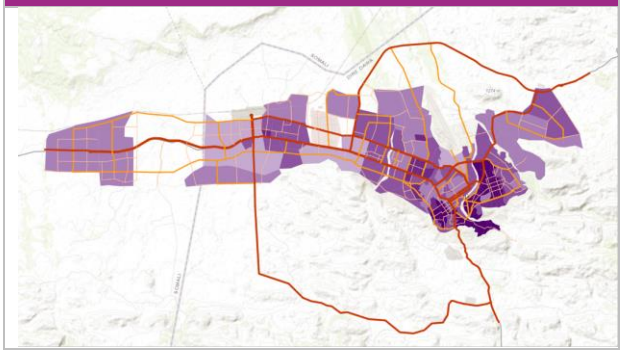


### 4.1.3. Parameter 3 – road network

Road network is a key parameter that sets an important part of the framework for both mobility and urban shape and articulates the two. Road network matches both mobility growth and urban development needs to serve and connect the different areas of the Greater Dire Dawa.

Road network shape and functions and according investment priorities are chosen according to targeted key network functions (missing links, connections, level of connectivity, choice of routes, etc.) as well as urban shape and population location and density. Different **variations of the parameter** can be defined according to the scenarios:

- level of upgrading of the existing road network
- level of extension of the road network
- level of connectivity of the overall new network (connections between the different roads)
- level of hierarchization of the network according to road categories

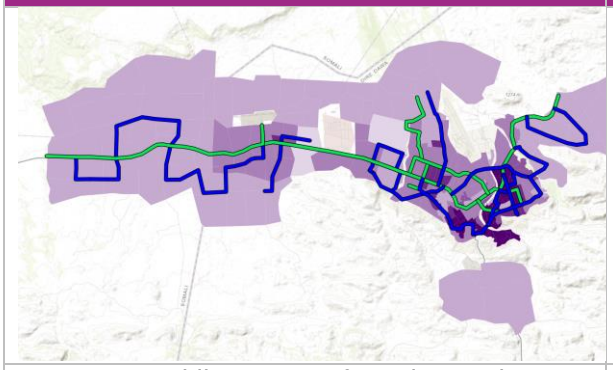
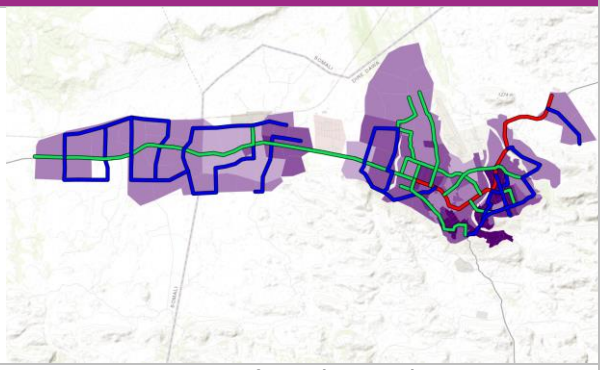
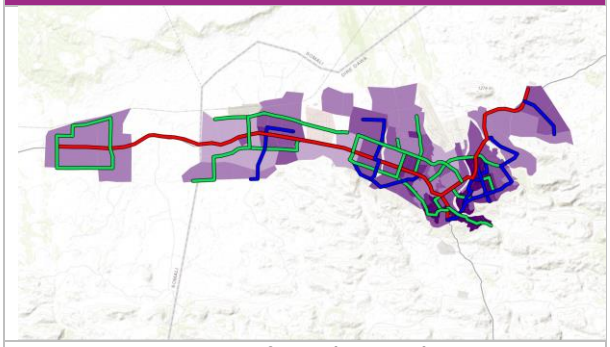
| Scattered city | Two cities |
|---|---|
|  |  |
| ■ 12% primary roads (+24 km)<br>■ 9% secondary roads (+63 km)<br>■ 20% tertiary road (+170 km)<br>■ 59% local roads | ■ 13% primary roads (+25 km)<br>■ 11% secondary roads (+73 km)<br>■ 15% tertiary roads (+104 km)<br>■ 62% local roads |
| **Polycentric city** | |
|  | |
| ■ 14% primary roads (+32 km)<br>■ 11% secondary roads (+70 km)<br>■ 14% tertiary roads (+100 km)<br>■ 62% local roads | |

### 4.1.4. Parameter 4 – mobility systems

The mobility system is matching mobility needs stemming from the territorial organization and city shape. It fits with the urban pattern and road network. Different variations can be met:

- type and level of development of the public transport supply
- combination of a top-down and bottom-up approach in public transport development
- type and level of development of NMT and personal modes
- level of integration of the mobility system
- level of matching between supply and demand

The mobility system consists in a combination of varied transport services and mobility uses having their own specific functions and addressing different needs. Without specifying given technologies or modes, three complementary types of services are considered: structuring services or mass transit (BRT, buses), metropolitan services (buses, minibuses), local services / micro transit (minibuses, bajaj).

| Scattered city | Two cities |
|---|---|
|  |  |
| ■ Current public transport footprint : 70 km<br>■ 2040 public transport footprint : 110 km<br>■ 6 standard bus lines (47 km)<br>■ 12 local bus lines (63 km) | ■ Current transport footprint : 70 km<br>■ 2040 public transport footprint : 123 km<br>■ 1 BRT Lines (13 km)<br>■ 8 standard bus lines (46 km)<br>■ 10 local bus lines (65 km) |
| **Polycentric city** | |
|  | |
| ■ Current transport footprint : 70 km<br>■ 2040 public transport footprint : 110 km<br>■ 3 BRT Lines (47 km)<br>■ 10 standard bus lines (56 km)<br>■ 7 local bus lines (27 km) | |

### 4.1.5. Parameter 5 – governance and financing

Transport governance is the result of mobility and city organization that themselves partly stems from urban development choices. For this reason, the variations of this parameter depend from the variation of the previous parameters to define a set of enabling conditions that best fit the territorial organization.

Different variations of the governance and financing framework can be met according to the scenarios:

- overall governance distribution between Federal, Regional and City level according to City layout and organization,
- transport authority shape according to type and level of services at stake,
- capacity to finance and implement mobility actions,
- integration between urban and mobility policies

Regarding this aspect, the development scenarios featured a vision for both the City and the mobility governance, that encompasses tools and procedures while relying on existing stakeholders. Although mixed instances or committees, it does not seem relevant to establish new institutions.

## 4.2. Three prospective mobility scenarios for Dire Dawa

### 4.2.1. Scenario 1 -scattered city - business-as-usual scenario (BAU)

Urban growth is brisk and Dire Dawa population has grown from 320 000 inhabitants in 2020 to 835 000 in 2040, both relying on its own growth and on the steady arrival of rural people. The latter are willing to settle in the city for better revenues and living conditions but sometimes just leave poor rural living conditions offering limited prospects. From a global view, Dire Dawa is seen as the **Ethiopian Eastern metropole** with a strong regional role as well as a strong transit position between Addis Ababa and the port of Djibouti.


Scenario 1 – scattered city

Though this overall position is good and well recognized, the internal organization of the city is seen as problematic. Many people think that population growth has not been matched by efficient urban development. Dire Dawa is considered both by inhabitants and outsiders as a **"boom city"** that has vastly overstretched its limits over the past twenty years without taking a chance to get properly organized to match the needs of its numerous inhabitants. Seen from the distance, it is a metropole, but the closer you get to it the less it looks like so. Urban development extends on about 30 km from East to West but is so patchy that it is somehow difficult to know if one has got in or out of the city. Housing condominiums, factories and informal development areas are dotted around and are separated by wide tracks of scarcely occupied land. In these conditions jobs and dwellings can be located wide apart, some residential areas lack of proper services and equipment while some road infrastructures just cross open land without obvious destination. In a context of weak integrated planning, some threats have turned to full weaknesses. Urban sprawl, discontinuous urban fabric and distended urban poles are not sustainable transport wise. This urban pattern stretches demand over wide areas and generates longer travel distances, putting pressure on households' budget and capacity to move around. The length of roads needed to serve this overstretched urban pattern is high,

regarding both investment and maintenance costs, thus diverting resources for much more needed mobility local interventions (street redesign, walkways, etc.) and public transport support.

The development of the **new industrial park (NIP)** has played its role in this situation. Vastly over-dimensioned in regard of population and economic growth, it has undoubtedly brought in some attractivity and development but on a very loose and scattered urban fabric. Its sheer location did not help, as it focused some potent investments as far as could be from the historical city centre thus leaving the area in between in a state of uncertain and low development. Informal development around main factories is strong as workers cannot afford daily transport from distant city areas to the factory.

The unnamed competition between the city of Dire Dawa and the new industrial park falling under federal control has not helped. The city developed alternative development areas within its own boundaries, opening vast stretches of land for development, especially to the East and to the South. These areas have only been partly developed being quite disconnected from the city centre. The eastern pole by the toll plaza of Djibouti highway is building up as a service hub for trucks and mixes both formal and informal settlements. Developments to the south on Harar road are scarcer. All in all, the overall supply or urban land could have accommodated a population twice as big as the existing one.

The amount of resources to open vast free lands to urbanization with equipment and infrastructures has not been matched by a proportional urban development. This scattered urban development has then meant a certain waste of resources and had poor results regarding urban organization. In addition, there has been little match between demand and supply, leaving some condominiums with significant vacancy rates while informal dwellings have kept steadily developing on the fringes of industrial and residential estates to accommodate the rural workforce. As a result, beyond the city centre, Dire Dawa looks like a patchy city lacking integration with disconnected settlements.

Many negative externalities are associated to that development pattern regarding the infrastructure network and mobility as a whole and, demographic pressure has not helped either. Long distances mobility patterns are generated by the scattered development of the city. It is costly for people, both in money and in time, and can refrain mobility and more widely social development As a consequence, transport supply is not fully adapted to needs and constrains even more mobility with uneasy trips and congestion.


Scenario 1 – scattered city – road network

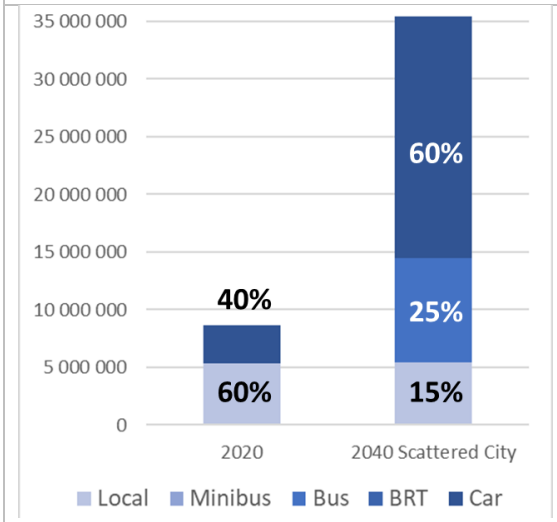
The **extended road network** does not satisfactorily fits with needs. It is overstretched and sometimes over dimensioned regarding urban projects that did not fully come or did not come at all. This comes at high price, both in investment and maintenance grounds. On the contrary, some roads are congested as investments have been driven to open new areas of urbanization rather than to upgrade and develop existing areas.

Collective transport supply falls under expectations in regard of the city level and economic profile:

- **No mass transit** has been implemented as flows are not concentrated enough to justify such a solution.
- medium transit solutions are found through **bus services** directly operated by the municipality. 60 buses are operated, but the service falls short of potential needs.
- privately operated **minibuses and Bajaj** are an important feature of transport supply. Minibuses have substituted to bajaj on the main axis and propose an upgraded service thanks to public support to rolling stock renewal (low rate loans).

Businesses and schools still organize their own transport services as no other supply can replace them.

## Carbon footprint

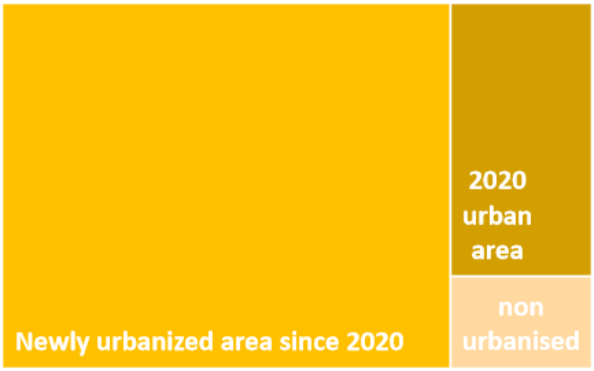



Annual emissions: 35 400 tCO2eq

Annual emissions per inhab.: 47 CO2eq (+ 73%)

GHG emissions cut compared to business as usual scenario: 0%

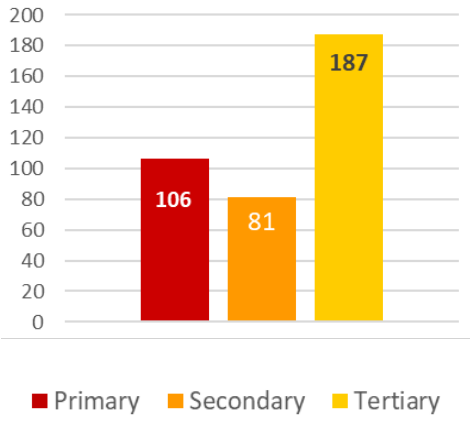
## urban footprint



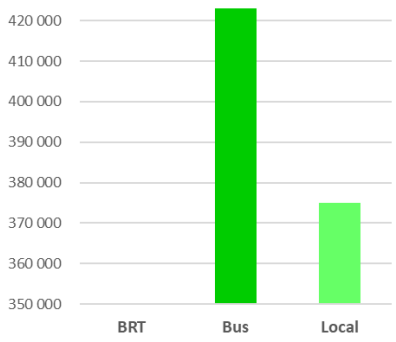

**2040 urban area - 141 km²**
**94% of Greater Dire Dawa**
**5 900 inhab./km²**

**2040 new urban areas - 114 km²**
**4 200 inhab./km²**

## Road network



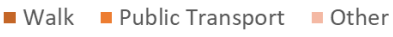

## Public transport network

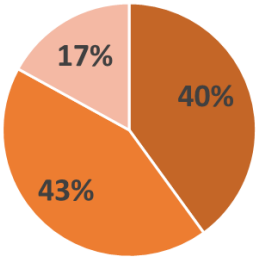



106 km/ 798 000 daily boardings

## Mobility & modal shares

+161% daily trips

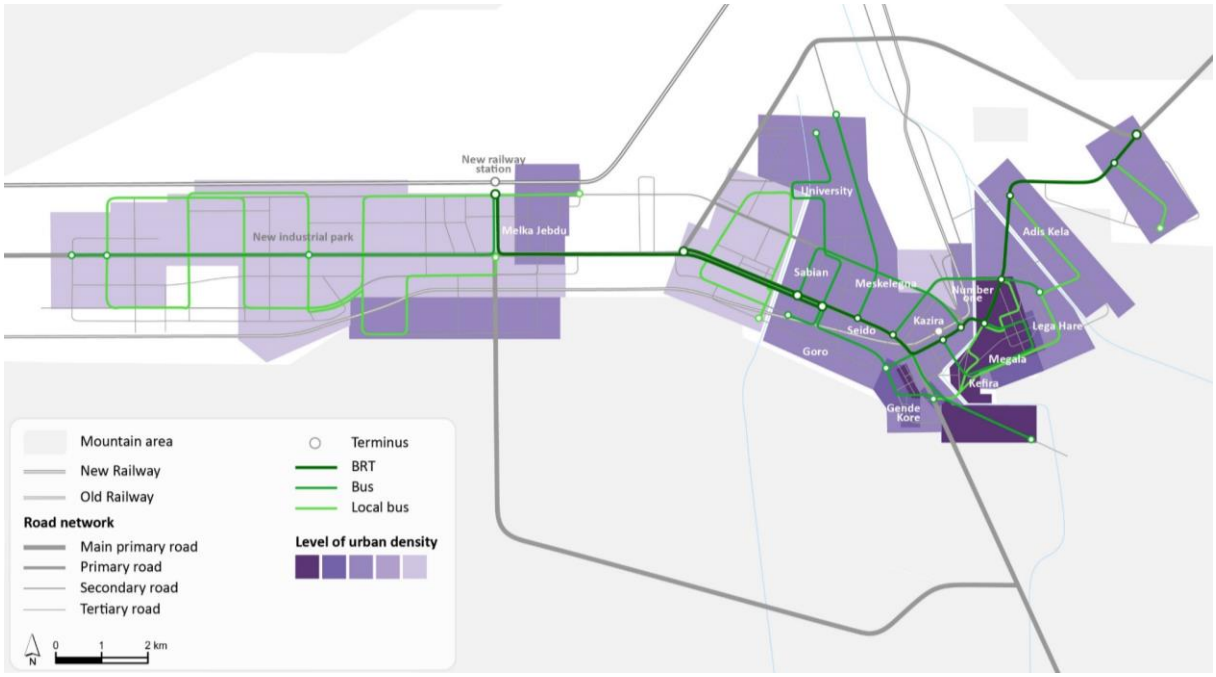



Scattered city scenario key figures

### 4.2.2. Scenario 2 – two cities

The development of Dire Dawa is much related to railway development. The first city of Dire Dawa was created at the beginning of the 20th century around the first railway station and the **new city of Dire Dawa** was created at the beginning of the 21st century around the second railway station. The growth of the new city along the new industrial park (NIP) has been impressive, starting from scratch in 2020 and accommodating 20 years later about 180 000 inhabitants and 70 000 jobs. The old city has also grown but on a lesser manner and accommodates now 655 000 inhabitants.




Scenario 2 – two cities

The new city has been humorously named **Addis Dire Dawa** (ADD), being a new city having its own development course[7] but also being closely supervised by the federal level from Addis Ababa. After a long-standing status of special development zone under Federal authority, the city only recently had its own Mayor to be officially commissioned and put under the authority of the Region of Dire Dawa.

Dire Dawa old and new are physically separated by a **buffer zone** standing between Melka Jebdu and the western edge of the old Dire Dawa. Originally planned for urban development, it was turned in an urban recreational area benefiting for both cities with different adapted equipment. The former industrial zone located in this zone has been slowly dismantled as opportunities to move to the new industrial park supported by generous subsidies lured industries away. Melka Jebdu and the new station area have functionally developed as districts of the new city, though still under Dire Dawa City administration. The latter thus found direct benefits in the creation of the new city as it propelled the development of the area.

Conversely, and exception made for the Station-Melka Jebdu area, the **old city of Dire Dawa** focused its urban development in a rather dense manner in areas contiguous to existing urbanized areas,

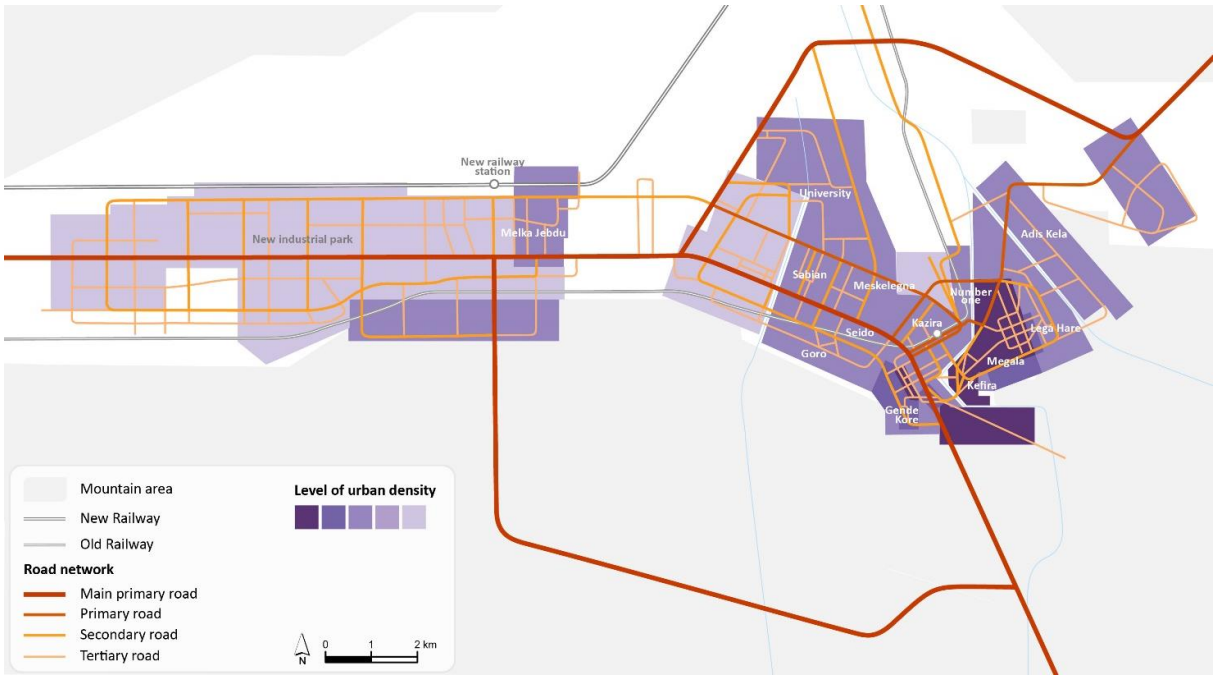
[7] new being translated by addis in Amharic.

especially to the north up to the bypass, now a clear limit to urbanization (University, airport). It also extended to the East towards the toll plaza on the Djibouti highway.

**New Dire Dawa** features a new city previously unseen in Ethiopia. with a mix of plants, residential and service/commercial areas. Urban development has been closely planned to combine these different areas in different districts. Between these districts, some **dense informal housing** has developed to accommodate workers and/or newcomers from the rural areas. The contrast is strong between planned and informal areas but they make a complementary mix and a strong economic case.

Besides the east-west axis linking them, the two cities have developed their own **road network**. New Dire Dawa has a carefully planned road system supporting its urban growth while Dire Dawa has improved and developed its roads to have a more hierarchized network supporting its densification and extension.

The two cities have developed their own mobility systems fitting with their needs. No breakthrough mobility solutions have been brought, but mobility needs are rather satisfactorily covered.




scenario 2 – two cities – road network

New Dire Dawa has developed a system of **electrical buses and minibuses** stemming from the needs of the employees of the different plants and taking benefit of the power supply of the plants. It extended from initial employee service to an all population one and proved a success. A significant part of operation costs is taken in charge by employers allowing to propose an efficient and cost attractive service to other users. These buses and minibuses partly run on dedicated lanes on the main city East-West axis, thus providing a quick and efficient service throughout the area. Bajaj are still in the picture, but rather low key for small distance trips, especially in the informal areas.

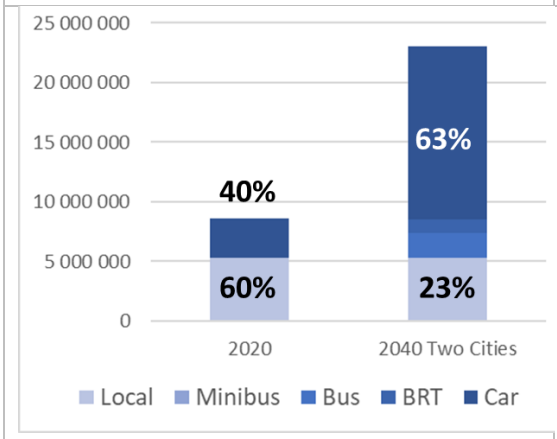
Old Dire Dawa still has a lot of Bajaj but has also developed minibus and bus supply on the main axis where concentration of services proved beneficial. Bus services have stemmed from the step by step

improvement of the municipally run Dire Dawa Bus company. Traffic and mobility management of the main city axis allows rather efficient relations through these modes.

Relations between old and new Dire Dawa are cared for by buses, partly running on dedicated lanes where road is wide enough to accommodate them (through all New Dire Dawa until the western edge of Sabian). This is not a full BRT though the system is attractive and efficient, as no dedicated lanes exist within old Dire Dawa and as frequency is not so high (no more than 8 min in peak hours). In fact, the majority of trips occur within each city rather than between the two cities.

Both municipalities have developed their own capacities to organize transport at their level in cooperation with the federal level. They have set a joint venture to commission a private operator on the line linking them.

## Carbon footprint

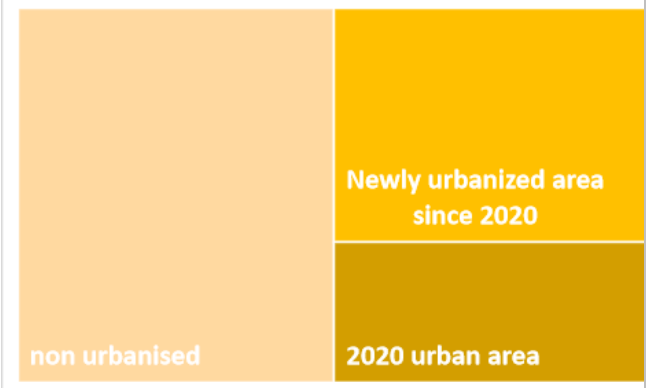



Annual emissions: 23 000 tCO2eq

Annual emissions per inhab.: 30 CO2eq (+ 13%)

GHG emissions cut compared to business-as-usual scenario: -35%

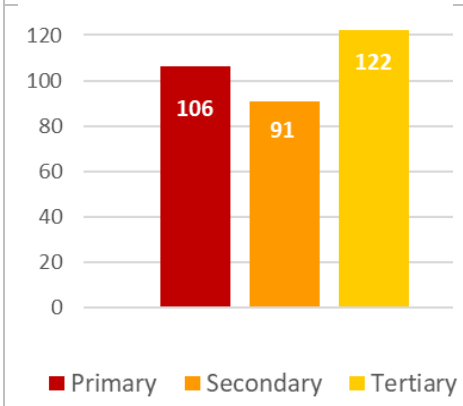
## urban footprint



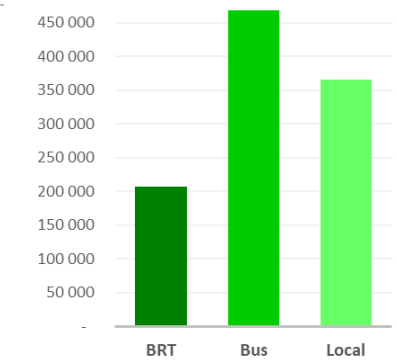

**2040 urban area - 75 km²**
**50% of Greater Dire Dawa**
**11 100 inhab./km²**

**2040 new urban areas - 47 km²**
**7 600 inhab./km²**

## Road network



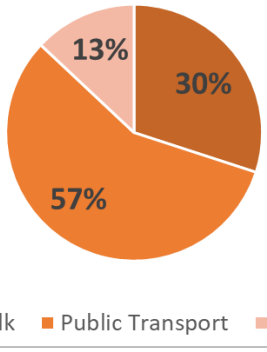

## Public transport network




119 km/1 041 000 daily board

## Mobility & modal shares

+161% daily trips




**Two cities scenario key figures**

### 4.2.3. Scenario 3 – polycentric city

Dire Dawa is considered in 2040 as "**many cities all in one"**. The overall metropole is a nearly 30 km long but structured by several well identified urban centres succeeding to each other along the city east-west axis. They are different in size, shapes and functions but complementary and well connected together.

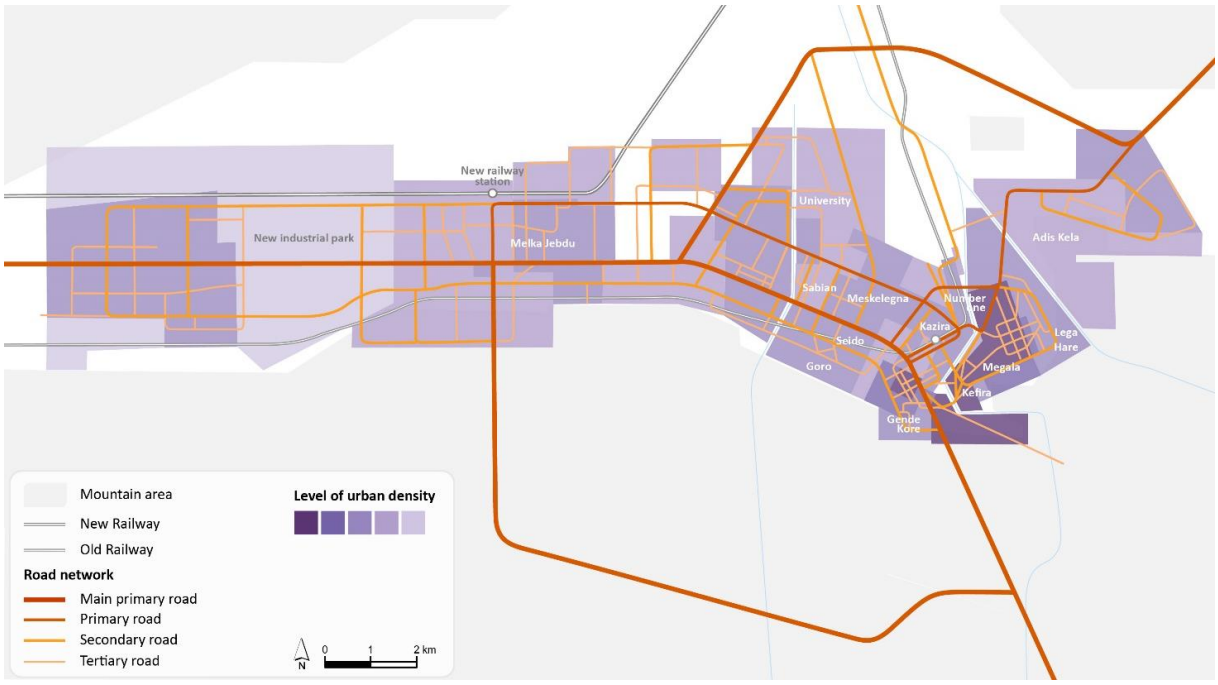

Scenario 3 – polycentric city

This organisation has been supported by an articulate **polycentric development strategy** mixing both urban, economic and mobility development on carefully targeted development areas. This policy born by the local level and supported by the federal level has proved successful over the years as it allowed step by step land opening to urbanisation as well as resource wise focused and tailored to needs investments in the different urban centres. It also supported a good articulation between public intervention (land opening to urbanisation, infrastructures, facilities and equipment) and private one, as real estate development and economic investments focused on these well identified areas as prime locations. A good level of urban density has thus been reached.

- After many variations in scope and ambitions, the **new industrial park (NIP)** was finally considered as one of the new centres of Dire Dawa. The eastern part of the NIP is focused on the railway station and surrounding areas and is developed in full integration with **Melka Jebdu**, gaining the name of "New station Kebele". Logistic services as well as a large range of commerce and services have grown. Further away the western part of the NIP has a fabric of large plants and residential areas. Both areas have been made compact and rather dense and services and amenities have developed. Many residents work in the area but the NIP also attracts some workers from the rest of the city through efficient transports.

- the **historical city centre** has kept developing and is still a focus for administrative and commercial activities, though not being anymore exclusive in that regard. Overall urban density has grown and major urban redevelopment happened in Kebele 3 on large tracks of land (former station, military areas). Informal settlements have been mostly regularised. The patrimonial value of Kezira and Kefira / Megala has been valued and allows to integrate Dire Dawa as a valuable stop in tourist tours to Harar.
- **Sabian and Goro** have kept gaining population to become a centre of their own completing the last third of the historical city. The area has a dense and friendly enough urban fabric in which a rich supply of shops and services have developed along major equipment (markets, university). Though the Butiji river is still a limit, Kebele 2 is well connected to Kezira and Megala and the three areas are now perceived as the core of the city.
- To the East, another new centre has been created at the entry of **Djibouti highway** though on a much lower scale, focusing its activities on road/truck services and a logistic platform. A few condominiums have been built by the Toll Plaza to accommodate workers and administration employees.

The **road network** supports the mobility needs of the urban centres as well as their development in densified areas or new urban extensions. The overall network is well balanced between main and local roads and is resilient to congestion. This is the result of carefully focused road investments as well as of integrated road management caring to accommodate all types of mobility uses -including NMT- but also to prevent street misuses and intrusions in a denser city. Street layout and low speed / low traffic local areas favours NMT.




scenario 3 – polycentric city – road network

West of the central railway station, the **old railway line** right of way has been turned into an urban boulevard and a linear urban park. It contributes to the development of the road network and

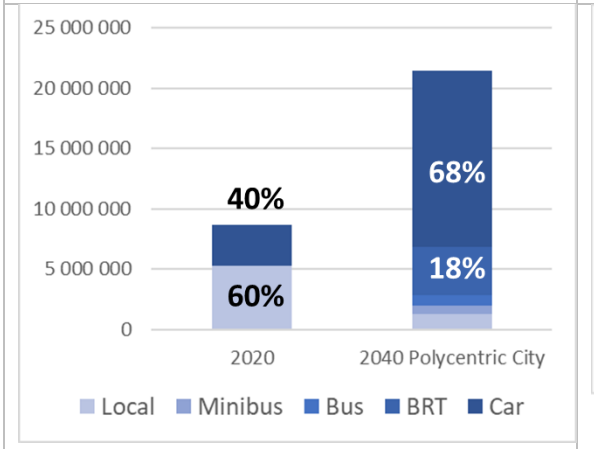
accommodates NMT in a friendly way. Local and vintage train services have been kept to the east as far as the Djibutian border. These trains are useful for local people and a tourist must-travel.

The **development of collective transport services** has taken advantage of the polycentric fabric of the city with the development of differentiated levels of supply within or between the centres. Global urban density allows to have efficient and profitable services at these different city scales.

- A **mass transit backbone** has been set on the East-West axis to link together the different centres of the city. A BRT has been chosen for its flexibility of service. In fact, BRT service is more frequent in the central area of Dire Dawa than on its Eastern, South-Eastern and Western extremities as all lines overlap there. However, this differentiated level of service is well adapted to demand and allows to maintain an economically efficient operation. In a first step for five years, buses had cared for the service which was then turned to BRT once success was proven and operating experience acquired.
- While BRT cares for a large part of citywide trips, **bus services** have developed on the main road axes in the main centres and groups of centres to provide district and inter district relations. They also act as feeder lines to the BRT. Bus services are adapted to needs and get denser in the main centres.
- **Minibuses and Bajaj** care for local trips. Minibuses have been developed with bajaj drivers to upgrade their services on the main ODs with some low-rate loans and grouped purchase of rolling stock. The result has been good as all stakeholders have found their interest in the deal.

A **public transport authority** (**Dire Dawa Transports**) has been created along the BRT as a public joint venture between municipal and federal level. It regulates the whole transport supply in the Greater Dire Dawa but directly manages the BRT and buses while minibuses and bajaj are left into private hands. Fare integration has been reached between BRT and buses to allow passengers to transfer without paying twice. Breakeven operation has been reached on economic grounds by a contribution of main businesses to the transport service, as it substituted to their own corporate systems.

## Carbon footprint

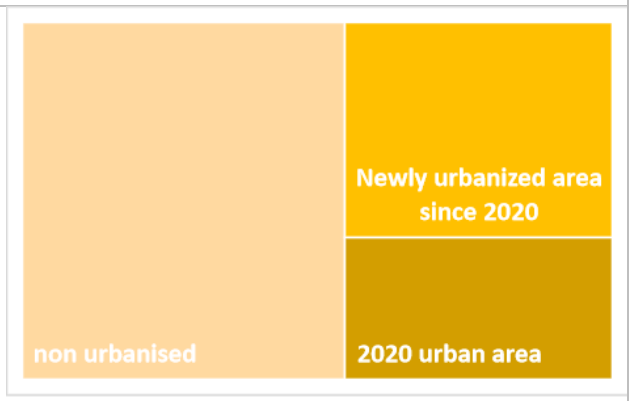



Annual emissions: 21 500 tCO2eq

Annual emissions per inhab.: 28 CO2eq (+ 5%)

GHG emissions cut compared to business-as-usual scenario: -40%

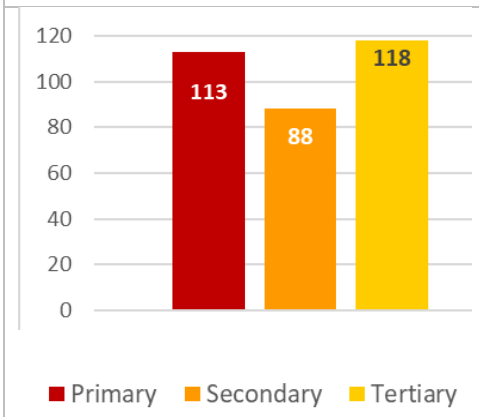
## urban footprint



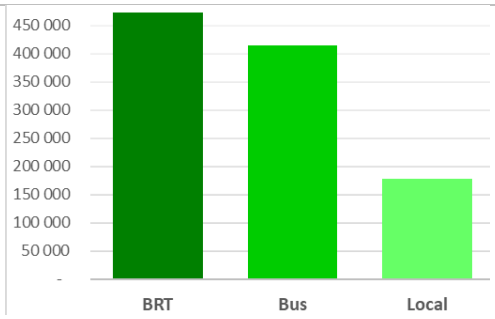

**2040 urban area - 68 km²**
**46% of Greater Dire Dawa**
**12 300 inhab./km²**

**2040 new urban areas - 41 km²**
**8 700 inhab./km²**

## Road network



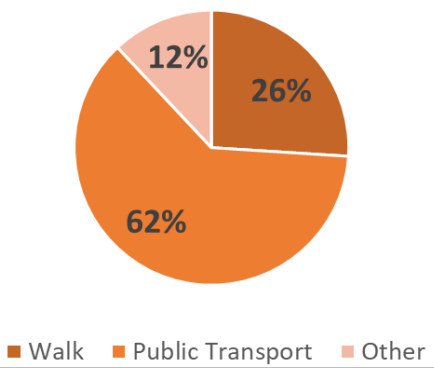

## Public transport network




109km/1 066 000 daily boardings

## Mobility & modal shares

**+161% daily trips**



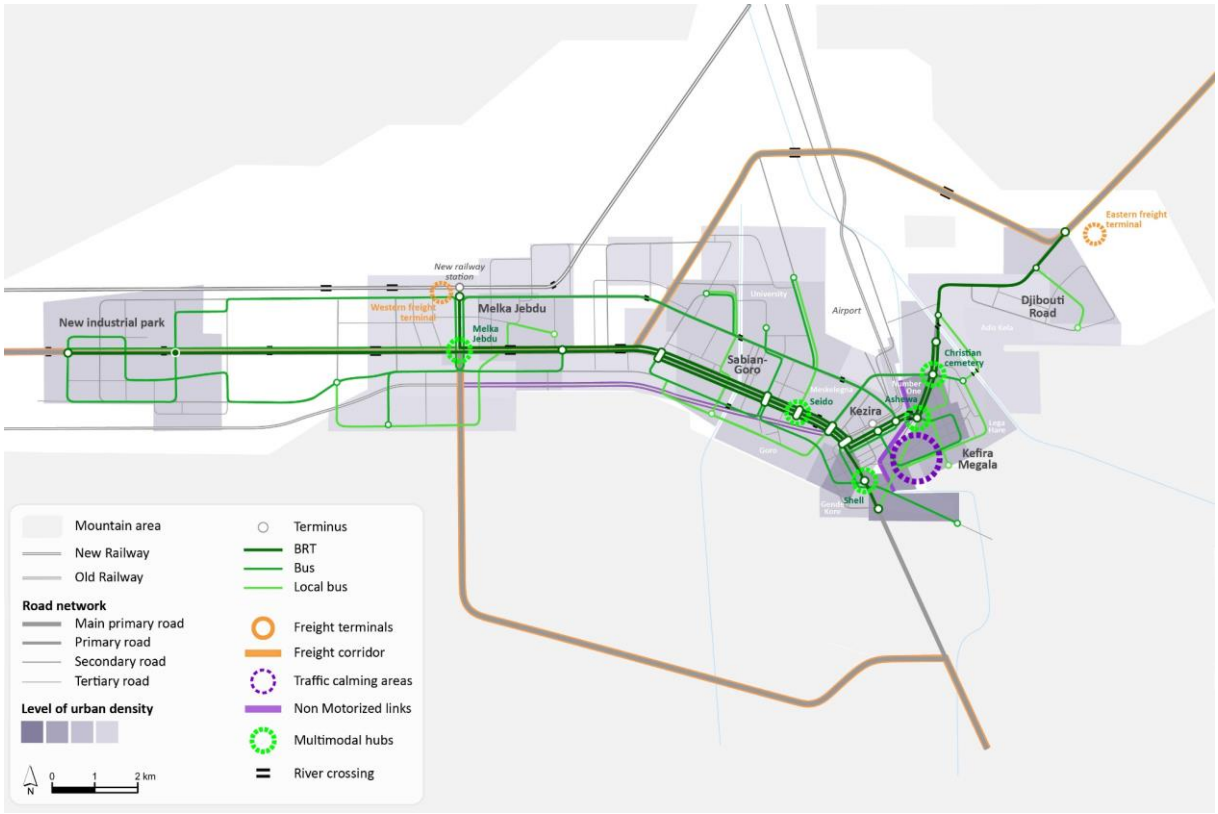

**Polycentric scenario key figures**

## 4.3. Vision

### 4.3.1. A polycentric, inclusive, compact and mobility-wise city

The mobility vision adopted through the discussions with local stakeholders relies on a polycentric city where communities are well connected through a rather compact urban shape allowing an efficient mobility system. In particular, the 2040 mobility vision considers:

- A strong economic development both industrial and commercial making Dire Dawa the eastern metropole of Ethiopia between Addis and Djibouti and being a significant mobility driver
- A strong choice to keep and develop NMT mobility habits while developing public transports, with a similar distribution of modal shares between the two (about 45% each)
- A more intensive mobility of all inhabitants still keeping wise in time and distances in a polycentric city.
- A mobility for all allowing all kinds of publics to move around with an affordable mobility system as a condition for an harmonious development: + 1.5 BRR per day in average while distance/time doubles.
- A connected and integrated mobility system based on a combination of transport modes articulated together to deliver an efficient, qualitative, and user-centred service (more than one connexion in average).



## 4.3.2. Urban vision

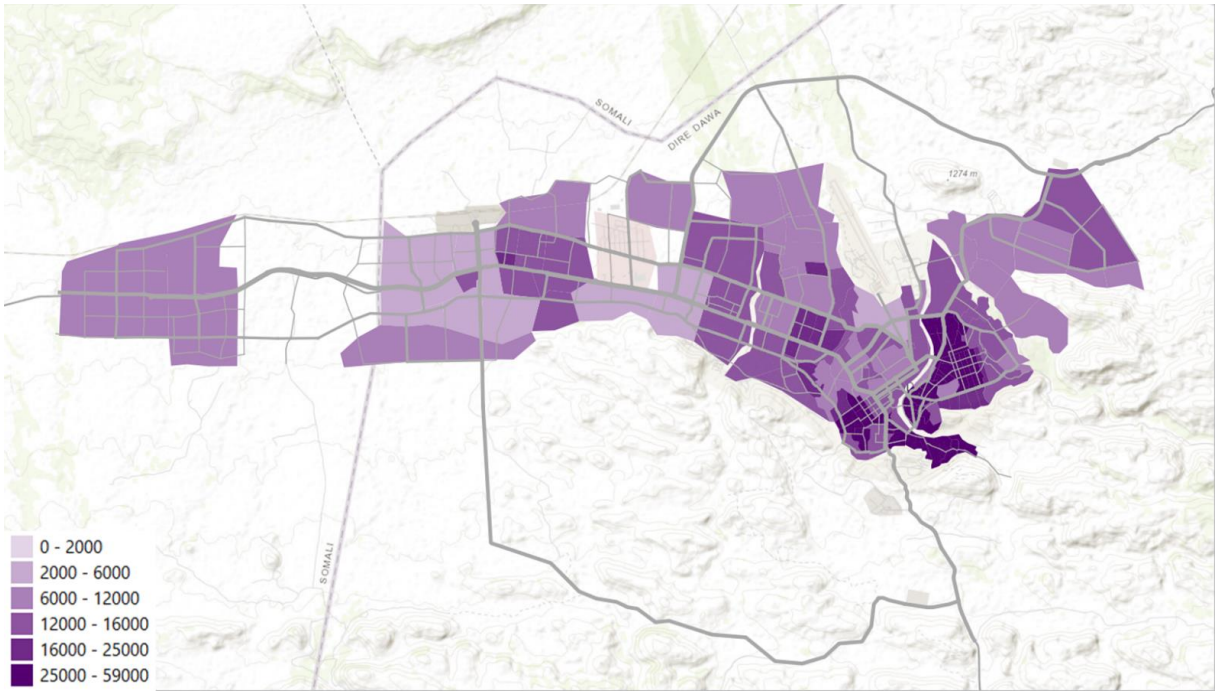
The urban vision proposed is a compact polycentric metropolitan area, kept within the structural boundaries of the new railway line (north), the mountains (east and south, the New Industrial Park (west) and the Toll plaza to Djibouti (east).

The polycentric urban structure has taken advantage of original neighbourhoods to develop them into urban polarities of their own. The diversity of their respective fabric, as well as the availability of all basic services and equipment enable inhabitants to carry out many of their daily activities within their polarity of residence.

This allows to limit the span of trips while dynamizing each centre. This mobility wise urban organisation results sustainable, both from a social and environmental perspective with a limit to unnecessary long trip and a better affordability of shorter trips for a wider public.

The city organisation also allows to rationalize transport supply, thus limiting investments and improving economic efficiency in operation.

The polycentric city is mobility wise and supports a sustainable and inclusive development of Dire Dawa.




**2040 population density**

## 4.3.3. Mobility vision

### Non-motorized transports

The existing ability to walk around the city is maintained and developed despite urban growth and the development of an affordable and qualitative public transport. While both factors are likely to extend

the average trip distance and generate a modal shift from walking to public transport, care is taken to support the best conditions for the most inclusive and sustainable of all modes. Additional aspects motivate the development of NMT:

- The full integration of NMT in the mobility system results in a safer and more qualitative urban environment,
- Walking is the most common mode for youngsters, a public to be particularly cared for their mobility experience as children will condition their behaviours once adults,
- Walking means physical exercise and has a positive impact on global health. It is as well a recreational and social activity.

The walkability of the whole road network is cared for, both on main axis and at micro district level. Some emblematic interventions are also taken to settle walking within the urban landscape and to provide a ground for both functional and recreational walks . Typical sites for this type of interventions are the fringes of rivers and the old railway line in its disused stretch towards Addis.

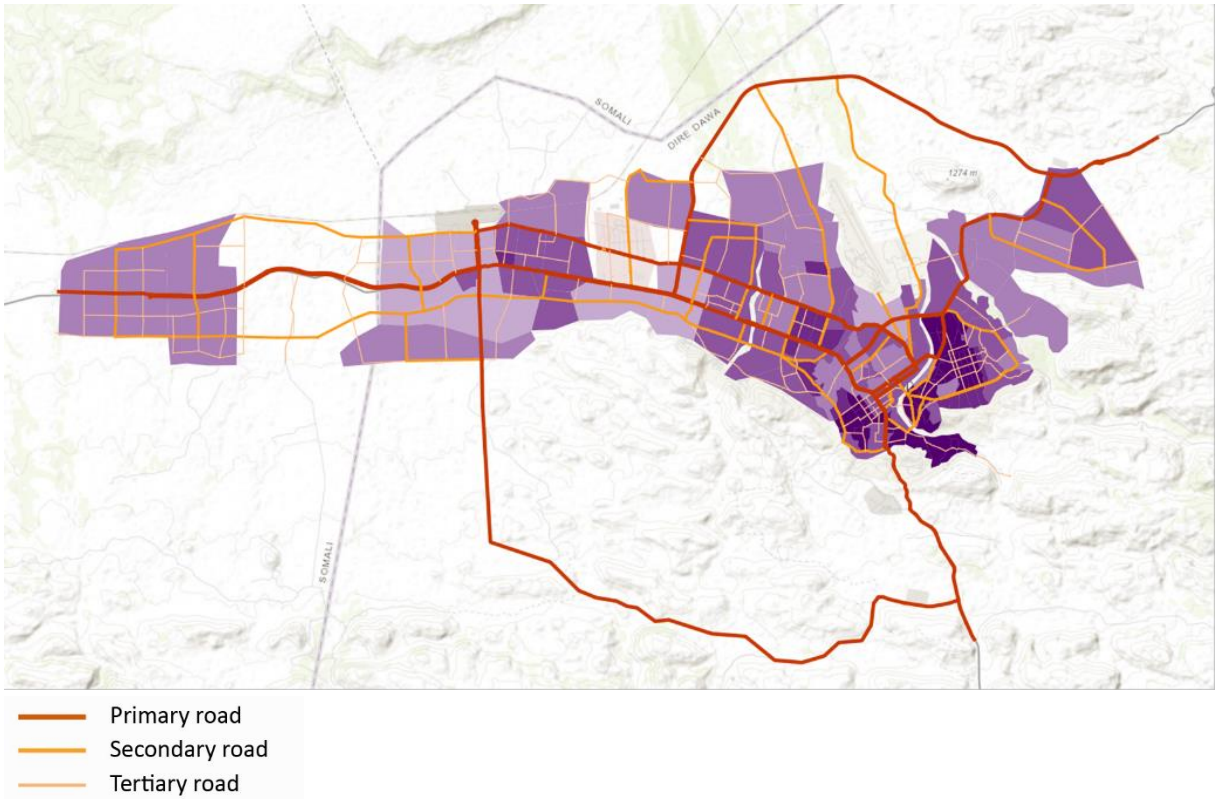
Pedestrian areas or areas with limited traffic are also contemplated in specific locations like marketplaces in dense urban area, in response to the issues faced by local stakeholders in these hot spots.

## Road network

The road network is hierarchized, dense, meshed and connected. It allows a wide range of routes through the city, it smoothly bears a varied range of mobilities and allows many type of flows to coexist, whether individual or collective, motorized or not. The shape and functions of the network allow to:

- Segregate transit between national freight flows and metropolitan and local trips
- Strengthen the primary network, providing alternative to the main east west axis and the Djibouti road
- Alleviate traffic in the densest areas to restore attractivity and safety to popular places and trips generators
- Improve the overall level of service, working on continuity and connectivity of a much reinforced secondary and tertiary network

Road axis are upgraded, more connections are created and are made more efficient (traffic management at intersections), new axis are created. For instance, an additional connection between Kezira and Megala is created to supply a more direct and suitable route deviated from busy marketplaces. The local road network is improved at district level to care for inhabitants accessibility right from their home.




**2040 road network**

## Public transport services

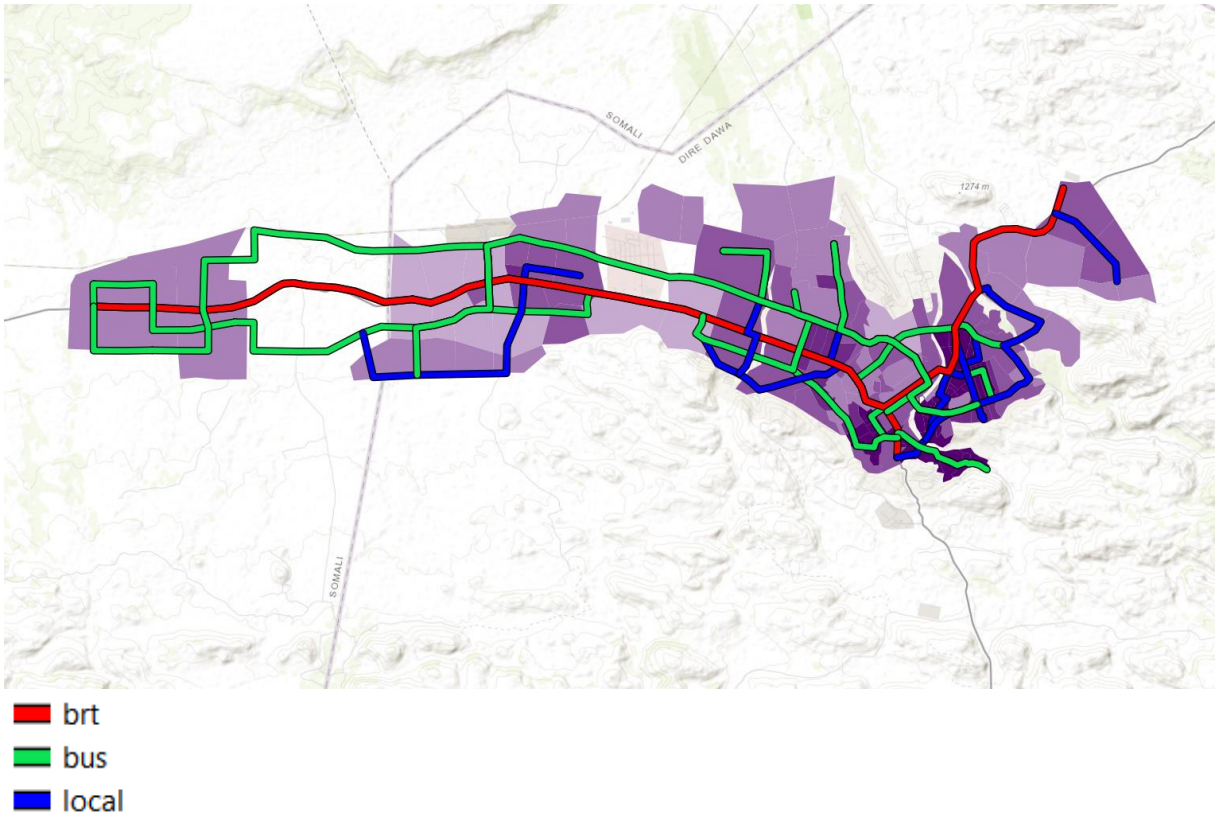
A hierarchized set of mobility services working together while being suited for distinct needs is in place and addresses all types of demand. The mobility system fits with demand and foreseen urban organization of the polycentric city.

Mass transit (BRT and buses) is the network backbone and provides both capacity and quality transport solutions on corridors supporting high demand and/or metropolitan flows. The BRT network serves the main road corridors and serves all urban polarities from the three main gateway of the metropolitan area. The bus network strengthens BRT services with additional east west links, respectively in the northern and southern parts of the city.

Three BRT lines run on the main East-West axis. They overlap in the metropolitan centre to provide a high level of service while serving each a peripheral area (western area for line A, eastern section for line B, south-eastern section for line C). bus services serve urban centres and link them together on the main road axis. they are both feeders and complements to the BRT. BRT and buses are operated by a private operator under public contract with fare integration between the two.

Micro transit / Paratransit is upgraded to fit with the emergence of mass transit and to propose reliable services at more local level and be sure to have a full city coverage. Beyond caring for local and district level demand, it also acts as a feeder service, thus enhancing the potential and attractivity of bus and BRT services. Paratransit is upgraded and restructured in a step by step manner, focusing on the quality of the service and the coordination with public transport supplies. They are privately operated, often

by former Bajaj drivers. Energy performance is another dimension of the process, to be fostered by public authorities.




**2040 public transport network**

## Public transport hubs

The PT network is articulated around existing and emerging urban polarities and mobility hubs, taking advantage of urban developments and road reorganization. Mobility hubs connect together different services to make them operate as one consistent system, which is the first level of integration of the transport supply. The following hubs can be highlighted:

- Existing transport hubs like Seido, Shell, Ashawa, are consolidated through proper facilities fostered in some cases by the road developments or upgrade,
- Christian cemetery on Djibouti road and Melka Jebdu are strategic locations for intermodal hubs, the latter being a gateway to the New Industrial Park and the new railway station;
- An additional hub is to be set for the New Industrial Park, serving both as interurban terminal and urban hub

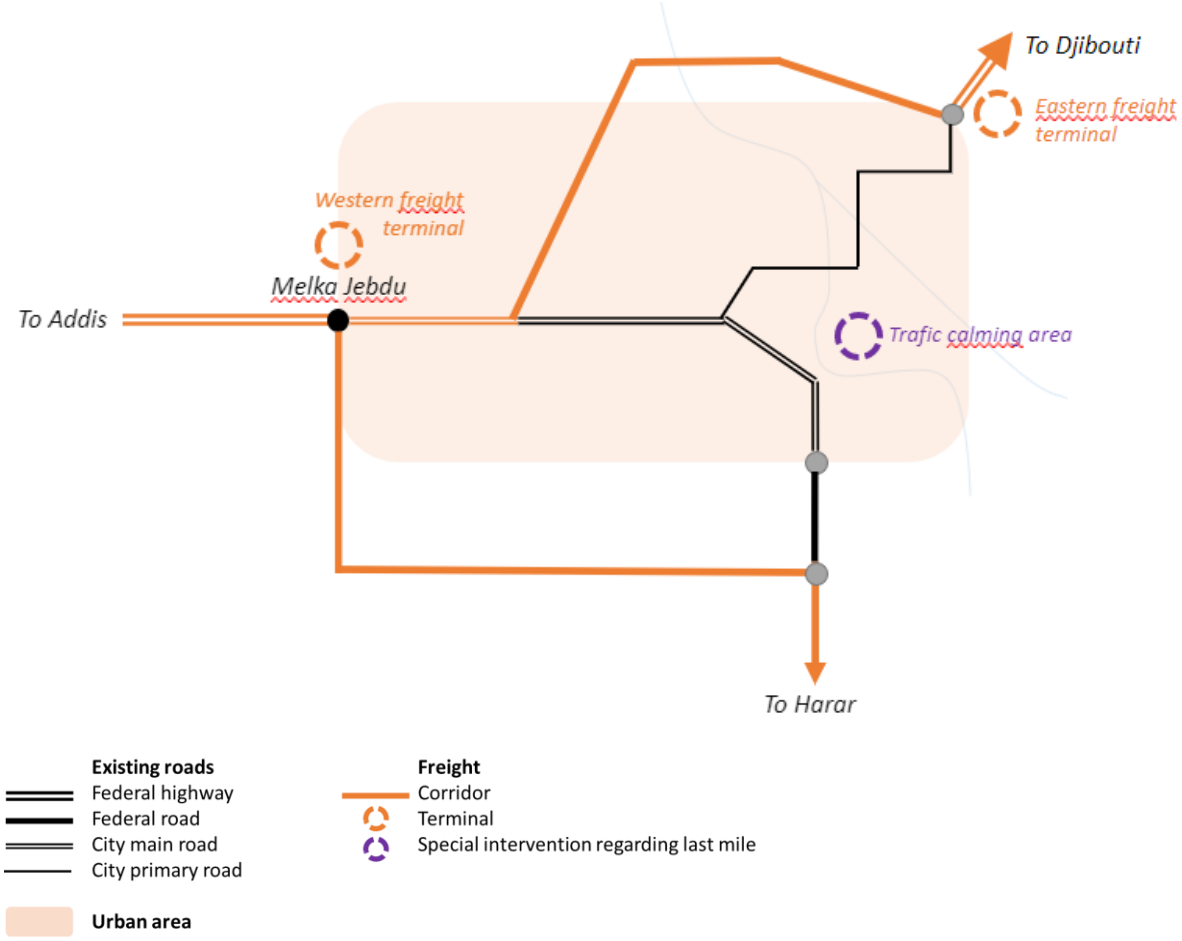
## National and regional freight

The 2040 mobility vision features a significant upgrade of the logistic system, partly levered by the completion of federal road projects and by the steady of traffic growth on the new railway line.

The objective is to make the most out of these assets, optimizing the circulation of goods within the metropolitan area while providing high-level logistic services (logistic hubs, dry ports). The first point

is addressed by a restructured road network and the identification of freight routes along the primary network. The attractivity of the Addis Abeba – Dire Dawa – Djibouti freight corridor is made stronger along and congestion is alleviated in the Dire Dawa city centre.

Another key aspect is the creation of dry ports and truck service areas near the Djibouti road Toll Plaza and the new railway station two major hubs of the logistic system. This will facilitate administrative registration of goods, flow controls as well as truck maintenance. Transit delays will be reduced.



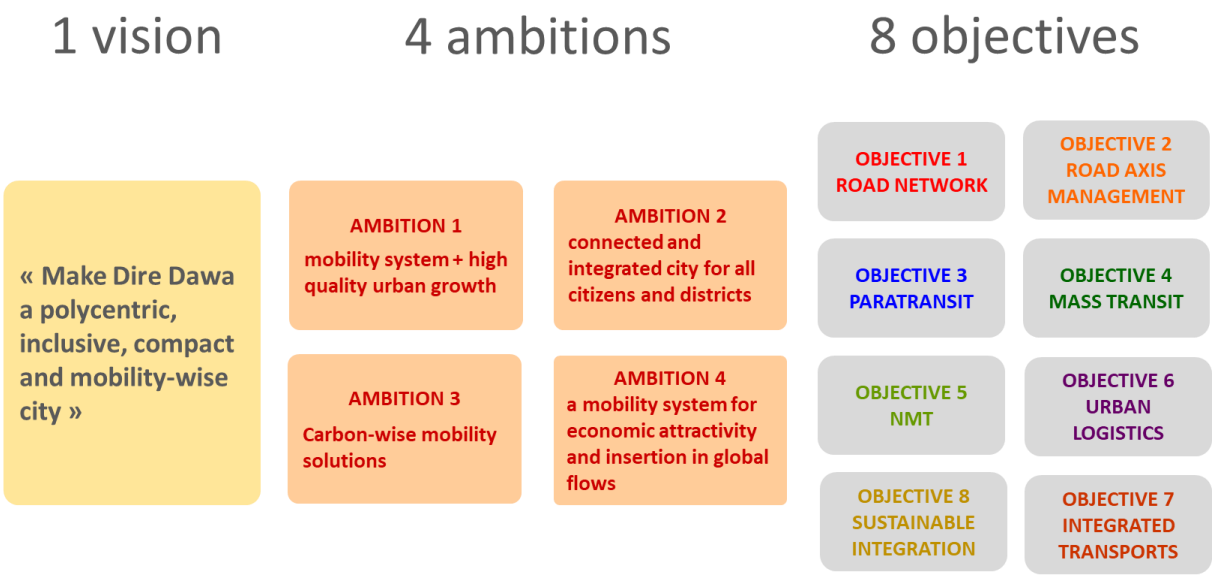

**2040 national and regional freight routes and terminals**

## Urban logistic

Ambitious actions are contemplated in urban logistics to upgrade city centre marketplaces, revamp their activities and make them landmarks of the city commercial activities in its central and historical areas. Their attractivity is boosted and competes well with other peripheral locations.

Traffic management measures allows to create accessible, safe and pleasant areas for shopping and for commercial activities. Traffic restrictions are taken within the densest areas around marketplaces, jointly with an appropriate management of last mile services and deliveries. Special effort is made to develop pedestrian facilities and amenities.

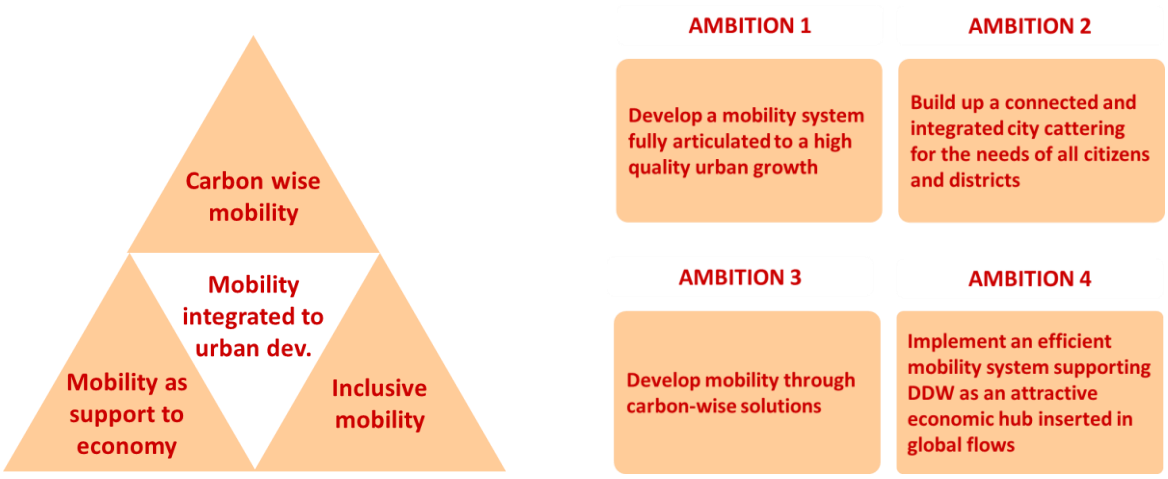
## 4.4. Objectives, targets and indicators




SUMP vision, ambitions and objectives

The overall vision for the future of mobility in the city of Dire Dawa can be summed as to **« Make Dire Dawa a polycentric, inclusive, compact and mobility-wise city ».**

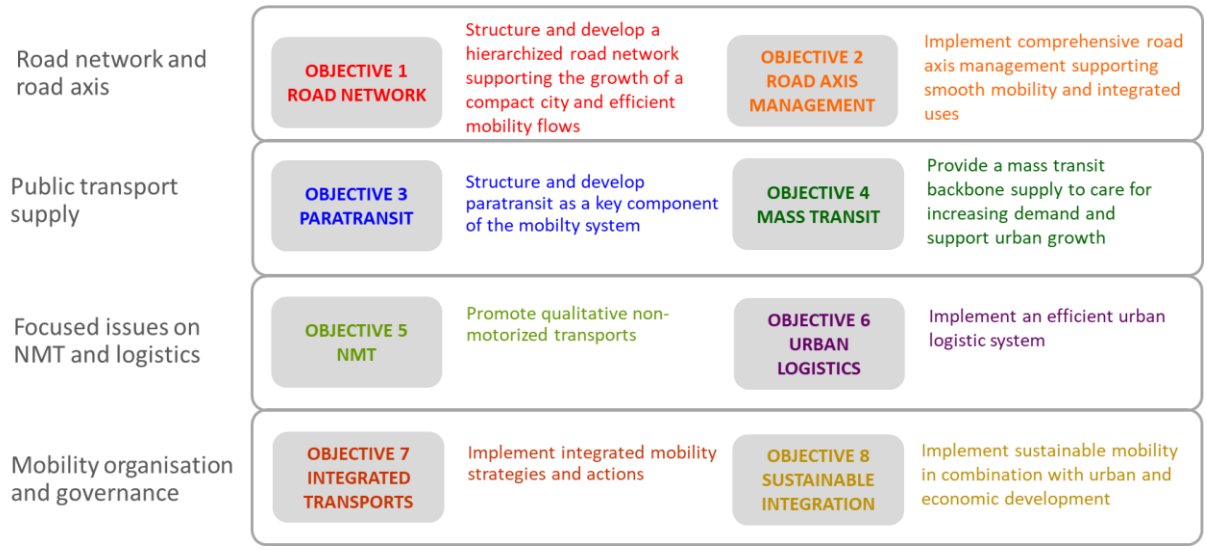
Four ambitions based on sustainable development principles are formulated from a mobility perspective and are fully embedded in the specific Dire Dawa context.




SUMP ambitions driven from sustainable development pillars

Eight objectives gathered in four groups embody the ambitions of the SUMP and cover the whole scope of activities enabling to materialise them. They allow to define both an articulate strategy covering all mobility aspects and a practical frame for an operational roadmap allowing to implement it.

All mobility actions stemming out of the SUMP are therefore related to these objectives and can be put in a bigger strategic picture, giving thus their full meaning and allowing to understand their relations and interfaces. This bigger picture supports both politic and operational level to give practical content to the strategies and to put actions in a broader strategic perspective.




**Eight objectives for the SUMP**

| **OBJECTIVE 1**<br><br>**ROAD NETWORK** | ***Structure and develop a hierarchized road network supporting the growth of a compact city and efficient mobility flows***<br>▪ *Hierarchised, meshed and connected road network*<br>▪ *supporting compact urban growth and densification*<br>▪ *caring for all mobility needs with high connectivity + resilience to congestion*<br>▪ *Integrated, multi-purpose road design caring for all means of transport* |
|---|---|

## Initial situation

The city road network is rather well developed and covers most of the urban area. Though in a rather correct situation, the current road network is loose, low connected and heavily congested on its main axis. Even if it is mostly made of small local roads, its hierarchy is turned upside down at the top: there are more primary level roads than secondary ones and more of the latter than tertiary ones.
The main road network can be hampered by limited connections (funnel on bridge or wades), some discontinuities (uncompleted works, sub-maintained sections) as well as by some mismatches between road profile and mobility functions, generating improper use of related road sections. In addition, as the national road network is still discontinuous, transit traffic is misdirected in the city, generating conflicts with other flows on some roads while some better suited ones are under employment.
In these conditions the main roads concentrate all types of traffic flows, ranging from pedestrians to national freight transit. They are not so much alleviated by the rest of the network due to its weak capacity. Traffic conditions are often downgraded by conflicts and congestion that affect both mobility, safety and life quality for residents.

## Objectives

The objective is to upgrade, structure and develop a hierarchized road network. Road network is a key factor for SUMP success, not only to support efficient mobility but also to grow along the polycentric city and foster compact urban growth and densification. It provides fair access to all city districts.
The objectives of the interventions of the SUMP are to:

- set coherent axes long road upgrades so that they can fully assume their mobility functions
- reinforce the upper levels of the road network by upgrading axes from their current level to the upper one (e.g. secondary road becoming primary one),
- **fill missing links** and create new roads allowing to provide more connections,
- improve the connections of the network with upgraded and new crossroads
- upgrade the local road network and create better connections with the rest of the network

The point is to foster a hierarchized, dense, meshed and connected road network supporting all mobilities and allowing all type of flows to coexist, individual and collective, motorized or not.
More route choices are possible for a same trip thus spreading traffic flows more widely and evenly and alleviating congestion on the main axes. The network gets more resilient to congestion and limits traffic induced nuisances. All mobility needs are cared for, from neighbourhood to metropolitan level.

## Actions

| | | |
|---|---|---|
| **Operational projects** | **1.A.1** | **Main road projects** |
| **Operational projects** | **1.A.2** | **Micro road projects** |
| **Process & guidelines** | **1.B.1** | **Road design guidelines** |
| **Process & guidelines** | **1.B.2** | **Road maintenance plan** |
| **Policies & strategies** | **1.C.1** | **Target road and crossroad network** |

**OBJECTIVE 2**

**ROAD AXIS MANAGEMENT**

## *Implement comprehensive road axis management supporting smooth mobility and integrated uses*

- *integrated traffic management*
- *road maintenance*

## Initial situation

Mobility along the main road axes is commonly affected by different types of road layout, congested crossroads and conflicting uses for the road and its immediate vicinity, whether between different transit uses (e.g. bajaj parking area vs traffic) or between transit and street side business. Such situations can be found at Seido crossroad and market, at Ashawa wade or Connel. As a consequence, effective road capacity falls much beyond its notional capacity. Different discrepancies and mismatches can be noted:

- layout on a given axis is not necessarily homogenous nor are its maintenance conditions,
- traffic regulation is not homogenous along an axis, generating congestion and conflicts, especially at crossroads,
- no management of the different uses of the road axis, generating user conflicts as well as unsafe conditions for mobility and other uses
- limited urban integration of the road axis and indistinct street side spaces.

This situation highlights rather watertight approaches between road planning, road design, maintenance and traffic regulation with a lack of integration and bigger picture to refer to. Currently traffic management is scarce and lacks proper organisation while maintenance resources are insufficient to cover needs.

## Objectives

The point is to provide room for every road function and uses and draw the best out of road capacity. Beyond one shot road investments, it involves adequate road maintenance to keep the road assets in working order. Management measures are taken to support smooth mobility and allow fair integration between the different road uses (vehicle flows, pedestrian flows, commercial activities, etc.). Better flow management, road maintenance and road behaviour from its various users contribute to sustainable urban mobility with better travel times and conditions as well as less negative externalities such as accidents or stress.

The objectives of the interventions of the SUMP are to:

- **manage mobility flows** in a network and axis logic to design and upgrade roads accordingly and to regulate the flows with adapted tools and processes (crossroad layout, traffic police regulation, traffic lights, overall city level traffic management, etc.)
- care for **smooth cohabitation of the road uses** and prevent conflicts with clear organisation of traffic lanes, especially at crossroads, clear pedestrian paths and crossings, adequate parking, regulated public transport stops, organised commercial activities leaving pavement and lanes free for circulation, etc.
- **maintain road infrastructure** from daily or seasonal measures (sweeping, drainage clearing) to more thorough maintenance actions (e.g. road surface replacement) with adequate resources.
- care for the **respect of circulation rules** by road users and for their implementation by traffic police

This homogenous and integrated approach of the main city axes requires the setting of a traffic and road management unit able to implement and coordinate actions.

## Actions

| | | |
|---|---|---|
| **Operational projects** | **2.A.1** | **Road axis upgrade projects** |
| **Process & guidelines** | **2.A.2** | **Traffic and mobility management** |
| **Policies & strategies** | **2.C.1** | **Circulation plan** |
| **Governance & finance** | **2.D.1** | **Traffic management unit** |

**OBJECTIVE 3**

**PARATRANSIT**

## *Structure and develop paratransit as a key component of the mobility system*

- paratransit as complement to mass transit
- Bottom-up approach and engagement with drivers
- Upgrade of vehicles and services

## Initial situation

With about 8 000 units and 260 000 trips a day, Bajaj represent most of the public transport supply in Dire Dawa. However, they are privately operated with little public regulation and no subsidy. Service is then strictly proportioned to profit and presents different flaws. It is focused on main mobility needs, whether in time (week base days, peak hours) or in space (main axes, main origin-destination pairs). Conversely, other needs and residual demand are poorly or not considered at all, leaving large chunks of demand unaddressed. Fare levels remain affordable for core demand but quickly get higher and much less affordable outside it.
Besides these market conditions, mixed feelings are expressed by Bajaj users regarding the quality to cost of services. Services are often used for lack of better alternative but are unsurprisingly considered as expensive, unevenly distributed and sometimes unsafe or abusive (regarding fares or behaviour).
In addition, the limited capacity of Bajaj makes them relevant up to a certain point. Foreseen population growth and urban developments, that are likely to increase trips number and distance, may well push up this micro transit system against its limits, adding to congestion, pollution and unsafe operating conditions.

## Objectives

The objective is to structure and develop paratransit as a full part of the mobility system along emerging mass transit supply. The point is to support its mutations to meet more local needs while upgrading service and making it more reliable. The idea is to be able to brand paratransit as one service among others only differing from them by scope and economic model with independent drivers operating on their own. Paratransit will keep an important part in satisfying a growing mobility demand. The objectives of the SUMP are to:

- **improve paratransit service** through engagement with drivers to improve service coverage and reliability in different ways: line organization, areas of service, time extension, transport hubs, fare regulation, low key massification (microbuses / minibuses), etc. Digital apps development (paratransit mapping and MaaS) will also be an opportunity to drive service upward.
- **support drivers** to buy/lease their **vehicles**. Most drivers currently own their Bajaj but buy it at high cost. The point is to allow drivers to buy /lease vehicles at a better price, both through grouped acquisition and bonified loans rate. This allows to have better and larger units (e.g. microbuses) and to require in exchange some engagements from drivers regarding fare level and service reliability.
- plan **complementarities between paratransit and emerging mass transit** as supply will deeply change with BRT and regular bus lines. Paratransit still remains relevant to address a growing mobility demand, but its functions need to adapt.
- care for the **paratransit economic and social aspects** through consolidation of paratransit service and by establishing bridges to activities in the developing mass transit sector for drivers.

A **bottom-up approach** is taken by the SUMP to upgrade paratransit. An **incremental and participative process** bringing together local, federal and private drivers is launched to support paratransit transition.

## Actions

| | | |
|---|---|---|
| **Operational projects** | **3.A.1** | **Paratransit structuration and development** |
| **Process & guidelines** | **3.B.1** | **Quality of service targets** |
| **Policies & strategies** | **3.C.1** | **Paratransit Transition Plan** |
| **Intelligence & capacities** | **3.E.1** | **Paratransit capacity reinforcement** |

| **OBJECTIVE 4**<br><br>**MASS TRANSIT** | ***Provide a mass transit backbone supply to care for increasing demand and support urban growth***<br><br>▪ Support to polycentric extension and metropolitan cohesion<br>▪ Keystone of PT system supporting its attractivity<br>▪ Trigger for public organized transport supply |
|---|---|

## Initial situation

Mass transit is not currently an issue for passenger transport in Dire Dawa as the micro transit supply carried out by Bajaj copes with demand. Switching abruptly from a small size supply to mass one would not make sense regarding demand level or economic balance. Structuring, transforming and developing the current services seems a fairer option for the short and medium term.
However, the city is now potentially at the early stage of a new step of its development with a scale of development that could radically change in the coming years. Strong urban population growth prospects can be contemplated as the city is building over a renewed and reinforced position at national level. A new railway line has replaced the old one and full road connectivity is soon to be achieved.

## Objectives

The objective is to provide a mass transit backbone supply to care for increasing demand and support urban growth. Given the magnitude of transport demand evolution in the next 20 years as well the planned extension of the city, mass transit is an opportunity to be firmly pursued. It will support the polycentric extension of the city and connect together its polarities. BRT is the most adapted service for this type and level of demand along with bus services. The structuration of a backbone mass transit supply will redefine and restructure the whole PT network and paratransit will adapt accordingly. The point is to develop an economic wise system with breakeven operation through its own revenues and potential limited complements to care for social and territorial inclusion.
A step by step implementation is needed to keep to the pace of demand evolution and to test progressively services, operation and operation management. The objectives of the interventions of the SUMP are to:

- develop a **BRT service** on the main east – west axis linking all the city polarities together. BRT lines will run on their own lanes, allowing high frequency and good travel speed.
- develop a **bus service** allowing metropolitan level relations in complement to the BRT with optimised circulation conditions (e.g. across intersections) to have reliable and frequent services.
- define a **new transport governance** to manage mass transit services. Mass transit setting and operation requires a Transport Authority associating the Federal and the city level. Its task will be to scope the project (service, PPP format) and mobilise adequate resources for both investment and operation phases. It will be also to start and follow up works and to supervise operation.
- implement **new operation schemes** to operate the mass transit network. BRT and bus operation need to be carried out by professional firms hired through a competitive process lead by the new transport authority. Monitoring and follow up are also the responsibility of the Transport Authority.
- set up an **integrated fare system for BRT and bus**es. This allows to have transfers between the different lines and make the system attractive. Economic balance is a key aspect to address in that regard.

## Actions

| | | |
|---|---|---|
| **Operational projects** | **4.A.1** | **Bus network development** |
| **Operational projects** | **4.A.2** | **BRT development** |
| **Governance & finance** | **4.C.1** | **Mass transit development plan** |
| **Policies & strategies** | **4.D.1** | **Mass transit fare integration** |

**OBJECTIVE 5**

**NMT**

## *Promote qualitative non-motorized transports (NMT)*

- street walkability
- pedestrian centred approach
- recreational walking and emblematic projects
- Cycling approach

## Initial situation

While being the first transport mode in Dire Dawa with a modal share of 46%, walking is an "invisible mode" or a "shadow mode". Infrastructures sometimes care for pedestrian mobility but neither systematically nor in a continuous manner. Due to lack of clear routes, pedestrians often end up on the road, melting in the overall traffic, which raises safety and traffic management issue.
With a young population, having a good opinion about walking, demand is prone to walk. However, the situation could change if car ownership increases. Indeed, the private car remains a symbol of wealth, freedom. It is also a more comfortable and reliable option compared to Bajaj.

## Objectives

The objective is to promote qualitative non-motorized transports and to Make Dire Dawa a fully walkable city. The point is to make walking it a fully assumed mode, with a clear understanding of its mobility value and positive externalities, from health or carbon perspective.
While the development and structuration of the public transport network is likely to divert people from walking, the SUMP supports a strong-willed policy to make non-motorized transports a desirable option whenever suitable. The ambition is to keep the current modal share of walking in the city by 2040.
The objectives of the interventions of the SUMP are to:

- support a **pedestrian-centred approach** relying on a comprehensive understanding of "walkability" in a context where planning has largely been conceived through road development.
- implement a **comprehensive planning approach** for NMTs
- **improve the walkability of road infrastructure** as a first and key lever, caring for its continuity and walkability from main road to local street. Walking needs to be integrated from design to implementation. Maintenance is also important to keep
- **care for walkability in connection to public transports,** walking being their natural complement,
- **support the rise of a cycling system** including adapted infrastructures and traffic management cycling facilities (e.g. parking), dedicated services and promotion of cycling through different actions (lending/ leasing for bicycles, cycling association, cycling days, etc.).
- value and promote **recreational walking and cycling**
- trigger a **change of mindset** among all stakeholders and encourage behaviours adaptation to create a pedestrian friendly environment,
- support **stakeholder empowerment** on NMTs with the emergence of pedestrian or cyclist associations.

## Actions

| | | |
|---|---|---|
| **Operational project** | **5.A.1** | **NMT projects** |
| **Operational project** | **5.A.2** | **Bikes for all** |
| **Process & guidelines** | **5.B.1** | **NMT integration in transport and mobility projects** |
| **Policies & strategies** | **5.C.1** | **NMT development plan** |
| **Intelligence & capacities** | **5.E.1** | **Pedestrian-centered approach** |
| **Awareness & empowerment** | **5.F.1** | **Walking in Dire Dawa** |

| **OBJECTIVE 6**<br><br>**URBAN LOGISTICS** | ***Implement an efficient urban logistic system***<br>▪ global freight transport system in regional and national flows<br>▪ urban logistics and last mile delivery |
|---|---|

## Initial situation

Dire Dawa stands out as a commercial hub at national and regional level thanks to its position between Addis and Djibouti, its influence over a wide regional hinterland and its own production basis. This trading function is consubstantial to the city and first came through the railway creation in the early 20th century. This hub position has been diversified and renewed, especially with the new railway line substituting to the old one. It is however incomplete as road connectivity is still lagging behind with a sub-optimal relation to Addis (planned to be improved).

These strong trade functions and position of the city generates substantial internal, exchange and transit freight flows. However, these flows of goods have not been translated yet into robust logistic chains combining infrastructures, logistic facilities, and freight flows organisation. This is both true at local or global level:

- At global level, connection to Addis is not good (road mountain to Addis stemming from the Harar road) and is also badly connected to the city centre where transit and exchange flows generate traffic conflicts and overcharge. The existing city bypass by the north is vastly underused as the highway to Addis it is supposed to connect to is not yet implemented. Truck transit is a nuisance in the city though it brings some related activity (services for trucks and drivers).
- At local level, commercial activities concentrated in the centre and in different markets (Kefira, Taiwan, Ashawa, etc.) generate flows from all the hinterland to the heart of the city. Carts, Small trucks (Suzuki) and Bajaj feed the economy without proper organisation in a tight urban fabric that strongly constrains access and deliveries. They generate different disorders or abusive practices detrimental to residents and the economy itself.

## Objectives

The objective is to implement an efficient urban logistic system to support the overall economic competitiveness of the city and to limit negative related impacts on the urban organization and quality of life. Perspectives for an economic development of the city driven by trade and industry are strong with a reinforcing position as the economic hub for Eastern Ethiopia between Addis and Djibouti. For that purpose, the urban logistic system is to be structured in a large extent, as it is a determining factor for city attractivity and a critical one when considering the urban environment itself.

The main objectives of the interventions of the SUMP are to:

- **support the growth of an efficient freight transport system caring for national and regional flows**. These flows will be diverted from the city centre through suited routes and adequate logistic services.
- **develop urban logistics caring for local flows and last mile delivery**. The overall objective is to make the urban area both a functional and liveable place, dealing with the dense urban patterns of urban marketplaces (e.g. Megala and Kefira) and achieve a supply chain model that ensures the security of goods and the attractivity of the marketplace.

## Actions

| | | |
|---|---|---|
| **Operational projects** | **6.A.1** | **Freight terminals** |
| **Operational projects** | **6.A.2** | **Urban logistics projects** |
| **Policies & strategies** | **6.C.1** | **Urban logistics development plan** |
| **Governance & Finance** | **6.D.1** | **Urban logistic manager** |

**OBJECTIVE 7**

**INTEGRATED TRANSPORTS**

## *Implement integrated mobility strategies and actions*

- Integrated mobility planning and actions
- Integrated governance and financing
- Fare integration
- Intermodal hubs organization

## Initial situation

The organization of the transport and mobility sector is currently split at several levels:

- **Between federal and local government**. Local government bears the responsibility of infrastructure investments but needs to find resources to finance them and depends on an insufficient Federal contribution for their maintenance. Some direct interventions have occurred by the Federal level in the local perimeter to implement projects of national interest (urban and infrastructure development on the new industrial zone). These interventions seem to match insufficiently with local planning and projects and risk to overburden already tight local maintenance capacities. Federal bodies also regulate urban transport services running in the city.
- **Between planning, implementation, funding and operation**: each activity is handled separately with limited feedback or overview of the whole system. Capital investment is insufficiently connected with operation and maintenance financing, which hamper the sustainability and efficiency of public action.
- **Between different transport infrastructures and services**. Mobility is insufficiently conceived in a global integrated approach though a number of civil servants are fully aware of the issue.

## Objectives

The objective is to implement integrated mobility strategies and actions, meaning that different types of mobility actions taken in the different areas of the city fit together and complement each other: infrastructures and services / uses, between investment and operation / maintenance, between planning and actions, etc.
A strong vision, coordinated actions, clear decision and financing channels are the keys of an integrated mobility Different departments/authorities need to interact on road investment, road maintenance and transport services. Integrated mobility is also embodied practically by the development of intermodal transport hubs.
The main objectives of the interventions of the SUMP are to:

- organize and develop **transport hubs** to address growing mobility and mass transit
- Coordinate **mobility strategies and actions** through SUMP implementation
- coordinate **mobility governance** between federal and local level and set up a Transport Authority
- care for mass transit **fare integration** to generate more mobility while keeping operation balance.
- care for **integrated mobility information** from classical ways to MaaS apps.

## Actions

| | | |
|---|---|---|
| **Operational projects** | **7.A.1** | **Transport hubs** |
| **Process & guidelines** | **7.B.1** | **Sustainable mobility planning process** |
| **Process & guidelines** | **7.B.2** | **Mobility data management** |
| **Process & guidelines** | **7.B.3** | **SUMP evaluation** |
| **Policies & strategies** | **7.C.1** | **Multimodality strategy** |
| **Policies & strategies** | **7.C.2** | **Energy-wise mobility** |
| **Policies & strategies** | **7.C.3** | **Demand management** |
| **Governance & Finance** | **7.D.1** | **Integrated Transport Authority** |
| **Governance & Finance** | **7.D.2** | **Integrated Mobility financing** |
| **Intelligence & capacities** | **7.E.1** | **Sustainable mobility project management** |
| **Intelligence & capacities** | **7.E.2** | **Inclusive, green and gender aware mobility** |
| **Awareness & empowerment** | **7.F.1** | **Inclusive, green and gender aware mobility** |

| **OBJECTIVE 8**<br><br>**SUSTAINABLE INTEGRATION/ TOD** | ***Implement sustainable mobility in combination with urban and economic development***<br>▪ coordinated urban and mobility development<br>▪ coordinated economic and mobility development<br>▪ planning and projects cross check<br><br>Nota: the objective is named "sustainable integration" or "Transit Oriented Development (TOD) through the document. |
|---|---|

## Initial situation

Dire Dawa was created as a railway boom city in the early 20th century and has been growing ever since. The city is now potentially at the early stage of a new step of its development with a new railway line replacing the old one and full road connectivity to be soon achieved. Along with strong urban population growth prospects, the scale of its development could radically change in the coming years.
Up to now, the rather compact and centre-focused development of the city has stimulated rather sustainable behaviours and mobility patterns ("grid" structure, large tendency to walk) which should be considered as a positive asset.
However, current ways of development show the discrepancy between mobility and urban or economic development which generates various suboptimal situations. Some risks are looming with new projects possibly favouring urban sprawl and an economic prosperity coupled with a relatively high spending power possibly favouring the increase of car ownership and pushing the city toward a car-oriented pattern.
Urban sprawl and scattered development make trips longer and services lower, unaddressed transport aspects of economic activities have negative effects in terms of nuisances and congestion and also harm global competitiveness.

## Objectives

In this context, it is of high importance to channel and coordinate the city development in order to maximise its benefit and prevent the negative externalities that could stem out of it. The point is to implement a sustainable mobility fully coordinated with urban and economic development. It is therefore important to have a global understanding of theses interactions and make them winning dimensions for the city.
The main objectives of the interventions of the SUMP are to:

- **coordinate mobility and urban development**. The targeted polycentric development is transport wise and allows a good coordination between the two dimensions. Infrastructures and mobility services are targeted where the people are and urban density is targeted where the transports are, making the best of each. Urban expansion is designed on density and contiguity, thus being mobility wise.
- **coordinate mobility and economic development**. Overall improvement of city global access with bypasses and new highways to Djibouti and Addis allows smoother freight transit and according facilities (logistic services, dry ports). It also opens up peripheral areas to economic development and limits interactions with the dense central areas. At a closer level, the organisation of last mile deliveries alleviates congestion in the dense commercial areas of the city centre.

Practically, this means that planning and actions in the fields of mobility, urban development and economic development are closely coordinated to draw every possible synergies between them. According responsible departments cross their strategies and actions for the purpose. Urban and economic projects are reviewed from a mobility point and conversely mobility projects are reviewed the other round. This allows to improve them as needed and possibly adapt their implementation.

## Actions

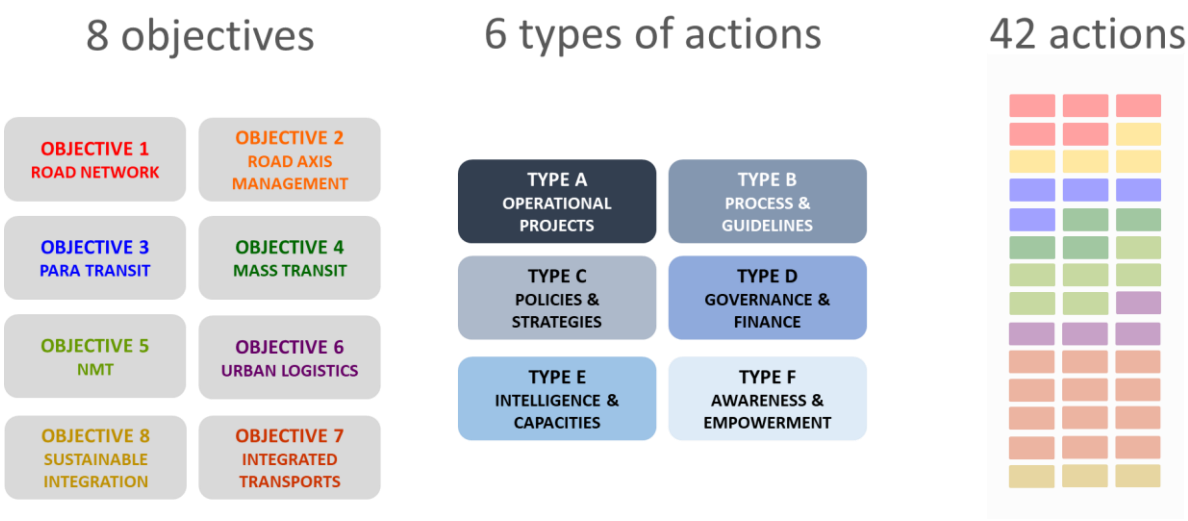
| | | |
|---|---|---|
| **Operational projects** | **8.A.1** | **TOD projects opportunities** |
| **Process & guidelines** | **8.B.1** | **TOD guidelines** |
| **Policies & strategies** | **8.C.1** | **TOD development plan** |

# 5. Selected scenario and actions

Actions have been defined by setting a matrix crossing:

- The **eight objectives of the SUMP**, which themselves addressed every issues raised through the diagnosis
- **Six types of actions** that cover all potential interventions to be carried out, from projects to awareness raising.

That way to define actions allows to not to set aside any meaningful action. All objectives are addressed in all possible relevant ways.




Objectives and types of actions

This matrix has been shared with SUMP stakeholders in the early steps of action setting in order to discuss their remarks and support their adhesion to the process. The matrix will be kept during SUMP implementation as a clear and practical compass that allows to understand how each action fits in the global picture and the other way round how objectives are duly addressed by according to actions. It is also a simple tool to be used to update the SUMP by adding, gathering or deleting some actions.

## 5.1. Actions list

The action matrix allowed to identify 42 actions that are presented below.

| # | OBJ. ID | OBJECTIVE short | ACTION TYPE | ACTION ID | ACTION NAME |
|---|---|---|---|---|---|
| 1 | 1 | road network | Operational projects | 1.A.1 | Main road projects |
| 2 | 1 | road network | Operational projects | 1.A.2 | Micro road projects |
| 3 | 1 | road network | Process & guidelines | 1.B.1 | Road design guidelines |
| 4 | 1 | road network | Process & guidelines | 1.B.2 | Road maintenance plan |
| 5 | 1 | road network | Policies & strategies | 1.C.1 | Target road and crossroad network |
| 6 | 2 | road management | Operational projects | 2.A.1 | Road axis upgrade projects |
| 7 | 2 | road management | Process & guidelines | 2.A.2 | Traffic and mobility management |
| 8 | 2 | road management | Policies & strategies | 2.C.1 | Circulation plan |
| 9 | 2 | road management | Governance & finance | 2.D.1 | Traffic management unit |
| 10 | 3 | paratransit | Operational projects | 3.A.1 | Paratransit structuration and development |
| 11 | 3 | paratransit | Process & guidelines | 3.B.1 | Quality of service targets |
| 12 | 3 | paratransit | Policies & strategies | 3.C.1 | Paratransit Transition Plan |
| 13 | 3 | paratransit | Intelligence & capacities | 3.E.1 | Paratransit capacity reinforcement |
| 14 | 4 | mass transit | Operational projects | 4.A.1 | Bus network development |
| 15 | 4 | mass transit | Operational projects | 4.A.2 | BRT development |
| 16 | 4 | mass transit | Governance & finance | 4.C.1 | Mass transit development plan |
| 17 | 4 | mass transit | Policies & strategies | 4.D.1 | Mass transit fare integration |
| 18 | 5 | NMT | Operational project | 5.A.1 | NMT projects |
| 19 | 5 | NMT | Operational project | 5.A.2 | Bikes for all |
| 20 | 5 | NMT | Process & guidelines | 5.B.1 | NMT integration in transport and mobility projects |
| 21 | 5 | NMT | Policies & strategies | 5.C.1 | NMT development plan |
| 22 | 5 | NMT | Intelligence & capacities | 5.E.1 | Pedestrian-centered approach |
| 23 | 5 | NMT | Awareness & empowerment | 5.F.1 | Walking in Dire Dawa |
| 24 | 6 | urban logistics | Operational projects | 6.A.1 | Freight terminals |
| 25 | 6 | urban logistics | Operational projects | 6.A.2 | Urban logistics projects |
| 26 | 6 | urban logistics | Policies & strategies | 6.C.1 | Urban logistics development plan |
| 27 | 6 | urban logistics | Governance & Finance | 6.D.1 | Urban logistic manager |
| 28 | 7 | integrated transport | Operational projects | 7.A.1 | Transport hubs |
| 29 | 7 | integrated transport | Process & guidelines | 7.B.1 | Sustainable mobility planning process |
| 30 | 7 | integrated transport | Process & guidelines | 7.B.2 | Mobility data management |
| 31 | 7 | integrated transport | Process & guidelines | 7.B.3 | SUMP evaluation |
| 32 | 7 | integrated transport | Policies & strategies | 7.C.1 | Multimodality strategy |
| 33 | 7 | integrated transport | Policies & strategies | 7.C.2 | Energy-wise mobility development |
| 34 | 7 | integrated transport | Policies & strategies | 7.C.3 | Demand management |
| 35 | 7 | integrated transport | Governance & Finance | 7.D.1 | Integrated Transport Authority |
| 36 | 7 | integrated transport | Governance & Finance | 7.D.2 | Integrated Mobility financing |
| 37 | 7 | integrated transport | Intelligence & capacities | 7.E.1 | Sustainable mobility project management |
| 38 | 7 | integrated transport | Intelligence & capacities | 7.E.2 | Inclusive, green and gender aware mobility |
| 39 | 7 | integrated transport | Awareness & empowerment | 7.F.1 | Inclusive, green and gender aware mobility |
| 40 | 8 | sustainable integration | Operational projects | 8.A.1 | TOD projects opportunities |
| 41 | 8 | sustainable integration | Process & guidelines | 8.B.1 | TOD guidelines |
| 42 | 8 | sustainable integration | Policies & strategies | 8.C.1 | TOD development plan |

Actions list

## 5.2. Cost estimates

### 5.2.1. Actions costing

#### Capital expenditures

Capital cost of each action is estimated according to a typology of unitary prices classified as per CAPEX, consultancy and administrative costs. The latter refers to effort needed from technical staff of the City administration to develop and follow-up the SUMP actions. It is calculated according to estimated man days and average salary.

In general, unitary prices are based on Ethiopian values either provided by local counterparts or extracted from studies of similar projects in Ethiopia. In particular, costs of Addis-Abeba BRT B2 have been considered[8], as well as World Bank report on road costing in Ethiopia[9]. Overall, the consistency of unitary prices has been checked against the Consultant knowledge and African experience.

More specifically, action costing has been built according to the following considerations.

- Main road projects CAPEX is based on km implemented per type of road – primary, secondary, tertiary, etc. As for micro road projects, the amount corresponds to a lump sum that is consistent with yearly investments of UIIDP in road interventions.
- Bus and BRT CAPEX are based on km implemented and level of service required to meet the demand, as for public transports. According to the action 7.C.2 about the energy policy, only thermic vehicles have been considered, as feasibility conditions for e-mobility are uncertain, even on the long term. The opportunity to introduce hybrid vehicles has been analysed but resulted limited in terms of environmental impact, while generating significant extra costs.
- The budget for NMT micro projects is set to 7% of the main road projects CAPEX. Main NMT projects budget is a lumpsum for one emblematic intervention, possibly a pedestrian promenade on the Dechatu banks or a rehabilitation of the old railway to the west. The consultation process has not highlighted a project concept that would meet stakeholders and public expectations and could have been considered as a baseline for costing.
- Bike purchase considers a lumpsum for about 1 000 bikes per programming period.
- Urban logistic CAPEX is focused on urban logistic, as freight terminals are yet overseen by the City Administration. Again, the exact concept to be developed through the corresponding action (6.A.2) should be defined in an incremental way, through intensive stakeholder dialogue. Related CAPEX is a lumpsum consistent with this type of project.
- Provision for TOD projects opportunities (action 8.A.1) is estimated on a lumpsum basis.
- Similarly, provisions have been estimated to support a range of actions involving material and equipment, such as Road axis upgrade projects (2.A.1) and Paratransit structuration and development (action 3.A.1).
- International consultancies are preferred for topics related to “advanced” concepts of sustainable mobility (typically the ones falling into objectives 7 and 8, respectively Integrated Transport and Sustainable Integration), as well as Mass transit and NMT policies. National consultancies are thus involved on objectives 1, 2, 3 and 6, but also policies update and “Awareness & empowerment” actions. Need for additional field survey is determined according to the purpose of the consultancy and existing data.
- Policies & strategies are meant to be updated every five years (e.g., once per programming period), along with Process & guidelines, to adapt to latest mobility developments and evolution.

[8] BRT B2 Pilot Line - Detailed Design - Final Report Mission 01, Addis Abeba Road Transport Bureau, 2019

[9] Implementation completion and results report, The World Bank, 2018 (https://documents1.worldbank.org/curated/pt/183691528124593286/pdf/ICR00004205-06012018.pdf)

- Administration costs are further detailed in the chapter 5.4. It is worth noting that they do not cover for the whole manpower of the Mobility Committee/Transport Authority over the SUMP implementation period but only the effort needed for actions development and follow-up.

| # | OBJ. ID | OBJECTIVE short | ACTION TYPE | ACTION ID | ACTION NAME | TOTAL |
|---|---|---|---|---|---|---|
| 1 | 1 | road network | Operational projects | 1.A.1 | Main road projects | 94 635 000 |
| 2 | 1 | road network | Operational projects | 1.A.2 | Micro road projects | 15 000 000 |
| 3 | 1 | road network | Process & guidelines | 1.B.1 | Road design guidelines | 312 458 |
| 4 | 1 | road network | Process & guidelines | 1.B.2 | Road maintenance plan | 312 458 |
| 5 | 1 | road network | Policies & strategies | 1.C.1 | Target road and crossroad network | 312 458 |
| 6 | 2 | road axis management | Operational projects | 2.A.1 | Road axis upgrade projects | 6 014 120 |
| 7 | 2 | road axis management | Process & guidelines | 2.A.2 | Traffic and mobility management | 14 120 |
| 8 | 2 | road axis management | Policies & strategies | 2.C.1 | Circulation plan | 387 458 |
| 9 | 2 | road axis management | Governance & finance | 2.B.1 | Mobility management integrated taskforce | 28 239 |
| 10 | 3 | paratransit | Operational projects | 3.A.1 | Paratransit structuration and development | 6 034 053 |
| 11 | 3 | paratransit | Process & guidelines | 3.B.1 | Quality of service targets/charter/comittment | 234 136 |
| 12 | 3 | paratransit | Policies & strategies | 3.C.1 | Target local transit network | 387 458 |
| 13 | 3 | paratransit | Awareness & Empowerment | 3.E.1 | Paratransit sector capacity reinforcement | 900 000 |
| 14 | 4 | mass transit | Operational projects | 4.A.1 | Bus network development | 27 080 457 |
| 15 | 4 | mass transit | Operational projects | 4.A.2 | BRT development | 157 659 204 |
| 16 | 4 | mass transit | Governance & finance | 4.C.1 | Mass transit development plan | 612 458 |
| 17 | 4 | mass transit | Policies & strategies | 4.D.1 | Mass transit fare integration | 600 000 |
| 18 | 5 | NMT | Operational projects | 5.A.1 | Main NMT projects | 3 000 000 |
| 19 | 5 | NMT | Operational projects | 5.A.2 | NMT micro projects | 6 624 450 |
| 20 | 5 | NMT | Operational projects | 5.A.3 | Bikes for all | 150 000 |
| 21 | 5 | NMT | Process & guidelines | 5.B.1 | NMT integration in transport and mobility projects | 24 917 |
| 22 | 5 | NMT | Policies & strategies | 5.C.1 | NMT development plan | 609 136 |
| 23 | 5 | NMT | Awareness & Empowerment | 5.E.1 | Pedestrian-centered approach | 300 000 |
| 24 | 5 | NMT | Awareness & Empowerment | 5.F.1 | Walking in Dire Dawa | 300 000 |
| 25 | 6 | urban logistics | Operational projects | 6.A.1 | Freight terminals | - |
| 26 | 6 | urban logistics | Operational projects | 6.A.2 | Urban logistics projects | 9 000 000 |
| 27 | 6 | urban logistics | Policies & strategies | 6.C.1 | Urban logistics development plan | 450 000 |
| 28 | 6 | urban logistics | Governance & Finance | 6.D.1 | Logistic pilot | 24 917 |
| 29 | 7 | integrated transport | Operational projects | 7.A.1 | Transport hubs reorganization | 3 593 750 |
| 30 | 7 | integrated transport | Process & guidelines | 7.B.1 | Sustainable mobility planning process | 3 322 |
| 31 | 7 | integrated transport | Process & guidelines | 7.B.2 | Mobility data management | 150 000 |
| 32 | 7 | integrated transport | Process & guidelines | 7.B.3 | SUMP evaluation | 9 967 |
| 33 | 7 | integrated transport | Policies & strategies | 7.C.1 | Multimodality strategy | 600 000 |
| 34 | 7 | integrated transport | Policies & strategies | 7.C.2 | Energy-wise mobility development | 450 000 |
| 35 | 7 | integrated transport | Policies & strategies | 7.C.3 | Demand management | 300 000 |
| 36 | 7 | integrated transport | Governance & Finance | 7.D.1 | Integrated Transport Authority | 28 239 |
| 37 | 7 | integrated transport | Governance & Finance | 7.D.2 | Integrated Mobility financing | 28 239 |
| 38 | 7 | integrated transport | Intelligence & capacities | 7.E.1 | Sustainable mobility project management | 450 000 |
| 39 | 7 | integrated transport | Intelligence & capacities | 7.E.2 | Inclusive, green and gender aware mobility | 300 000 |
| 40 | 7 | integrated transport | Awareness & Empowerment | 7.F.1 | Inclusive, green and gender aware mobility | 28 239 |
| 41 | 8 | sustainable integration | Operational projects | 8.A.1 | TOD projects opportunities | 6 016 611 |
| 42 | 8 | sustainable integration | Process & guidelines | 8.B.1 | TOD handbook | 230 814 |
| 43 | 8 | sustainable integration | Policies & strategies | 8.C.1 | TOD development plan | 225 000 |
| 44 | 8 | sustainable integration | Governance & Finance | 8.D.1 | TOD funding opportunities | - |

## Action costing

## Operation expenditures

Similarly to road CAPEX, road OPEX are detailed according to the rank of the road and based on local data. BRT and bus OPEX are based on common rules for operation design and local manpower and fuel cost.

| Price /year /km (EUR) | Tertiary road | Secondary road | Primary road |
|---|---|---|---|
| **Annual routine maintenance** | 1 500 | 2 000 | 3 000 |
| **10 years periodic maintenance** | 6 000 | 26 000 | 44 000 |
| **TOTAL** | 7 500 | 28 000 | 47 000 |

**Road OPEX (euros)**

| Item | Comment | Cost | Unit |
|---|---|---|---|
| **Salaries** | Director | 36 000 | EUR/year |
| | Manager | 24 000 | EUR/year |
| | Senior Technical | 8 640 | EUR/year |
| | Engineer | 5 760 | EUR/year |
| | Technical | 4 320 | EUR/year |
| | Driver | 3 600 | EUR/year |
| | Junior | 2 880 | EUR/year |
| **Fuel** | | 0.54 | EUR/km |
| **Fleet insurance** | | 1 500 | EUR/veh |
| **Maintenance** | | 0.6 | EUR/km |
| **Administrative expenses** | | 4% | % variable costs, maintenance, personnel |

**Public transport OPEX (euros)**

# SUMP cost breakdown

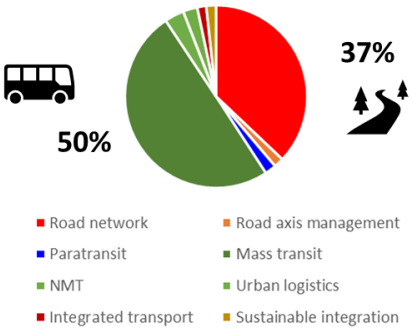
98% of the budget corresponds to operational projects or capital-intensive actions, involving infrastructure developments. Therefore, Mass transit and Road network come as the two first objectives budget wise.

| ACTION TYPE | PREPA | ST | MT | LT | TOTAL |
|---|---|---|---|---|---|
| Operational projects | 6 645 | 48 990 984 | 177 439 923 | 108 370 092 | 334 807 644 |
| Process & guidelines | 159 967 | 399 917 | 403 239 | 329 070 | 1 292 193 |
| Policies & strategies | 382 475 | 1 587 458 | 1 213 289 | 1 138 289 | 4 321 512 |
| Governance & finance | 9 967 | 337 375 | 187 375 | 187 375 | 722 093 |
| Awareness & empowerment | 153 322 | 458 306 | 458 306 | 458 306 | 1 528 239 |
| Intelligence & capacities | 75 000 | 225 000 | 225 000 | 225 000 | 750 000 |
| **TOTAL** | **787 375** | **51 999 041** | **179 927 133** | **110 708 132** | **343 421 681** |

**Budget per type of action (euros)**

Mass transit accounts for half of the SUMP budget, BRT development representing about 158 MEUR/ 8 848 M ETB. This strongly impacts the distribution of investment needs over time. Indeed, 52% of the budget is expected to be spent in the midterm, when the BRT system is introduced. Conversely, the first seven years of the programming period require moderate investments, which is an opportunity for the City to consolidate the financing plan.

Road network account for 32% of the total budget and are rather spread over the SUMP programming period. Main road projects thus add up 95 MEUR / 5 127 METB.




While actions responding to the NMT objective represent 3% of the SUMP budget, it does not cover all pedestrian facilities to be delivered. Indeed, the Road network objective considers the road as an inclusive support of mobility. Road development or upgrade interventions are therefore meant to be undertaken according to the state of the art, thus including qualitative pedestrian facilities that suit the rank of the road.

It is worth noting that 18% of the SUMP budget (about 69 MEUR/3 864 METB) is related to the New Industrial Park internal infrastructures and services. This amount reaches 82 MEUR/4 592 METB when adding road developments meant to connect the existing city to the New Industrial Park.

The figures below detail the budget as per objective and programming period.

| OBJECTIVE | Preparation | Short term | Mid term | Long term | TOTAL |
|---|---|---|---|---|---|
| Road network | 232 475 | 25 234 967 | 38 454 967 | 46 649 967 | 110 572 375 |
| Road axis management | 159 136 | 2 094 934 | 2 094 934 | 2 094 934 | 6 443 937 |
| Paratransit | 157 475 | 2 468 272 | 2 464 950 | 2 464 950 | 7 555 648 |
| Mass transit | - | 15 409 776 | 121 971 662 | 48 570 681 | 185 952 119 |
| NMT | 150 000 | 1 910 797 | 5 687 028 | 3 260 678 | 11 008 503 |
| Urban logistics | - | 3 308 306 | 3 083 306 | 3 083 306 | 9 474 917 |
| Integrated transport | 88 289 | 1 571 989 | 2 859 489 | 1 421 989 | 5 941 757 |
| Sustainable integration | - | - | 3 310 797 | 3 161 628 | 6 472 425 |
| **TOTAL** | **787 375** | **51 999 041** | **179 927 133** | **110 708 132** | **343 421 681** |

Budget per objective and programming period (euros)

The SUMP budget covers investment costs (CAPEX), consultancy costs and administration costs. Investment costs is preponderant between the three categories. Consultancy amount per objective varies between 375 000 and 1 500 000 EUR per objective. It encompasses both national and international consultancies, some integrating field surveys. Administration costs are further described in the chapter 5.4.

| | Administration | CAPEX | Consultancy | Total général |
|---|---|---|---|---|
| road network | 37 375 | 109 635 000 | 900 000 | 110 572 375 |
| road axis management | 68 937 | 6 000 000 | 375 000 | 6 443 937 |
| paratransit | 55 648 | 6 000 000 | 1 500 000 | 7 555 648 |
| mass transit | 103 821 | 184 648 298 | 1 200 000 | 185 952 119 |
| NMT | 34 053 | 9 774 450 | 1 200 000 | 11 008 503 |
| urban logistics | 24 917 | 9 000 000 | 450 000 | 9 474 917 |
| integrated transport | 98 007 | 3 593 750 | 2 250 000 | 5 941 757 |
| sustainable integration | 22 425 | 6 000 000 | 450 000 | 6 472 425 |
| **Total général** | **445 183** | **334 651 498** | **8 325 000** | **343 421 681** |

Budget per objective and cost category (euros)

## 5.3. Implementation planning and funding

### 5.3.1. Financing and funding sources

#### Financing sources

Compared to the current situation, three additional sources have been aggregated to the former contributors to the transport sector financing:

- **IFIs loan**: it is expected that infrastructure developments will be supported by IFIs to a certain extent, depending on the type of intervention. Public transport or NMT oriented actions are likely to be supported up to 80%. The BRT being partially auto financed, IFI contribution could be limited to 50% of the total amount of the project.
- **Federal dotation for the New Industrial Park (NIP)**: part of the infrastructures and services contemplated for the mid and long term correspond to the internal transport supply of the New Industrial Park, a major urban project led by the Federal Government. It is therefore considered that the City Administration would not be charged for the related cost, as it is not involved into the project. The final status of the NIP being undetermined for now, the financing plan of the SUMP integrates a federal dotation covering these costs.

- **Private sector**: road developments of lower priority or motivated by future urban extensions are considered to be realized, operated and maintained under private concession, should they prove profitable. This applies to the eastern bypass, as well as the roads contemplated to serve the Toll Plaza development zone. Both components are included in the Structural plan. Public funds are then concentrated on more relevant and profitable infrastructures at a shorter term.

The figure below details the potential contribution per financing sources. In particular, potentials associated to existing financing sources rely on realistic and cautious assumption of annual growth:

- The **City budget** is expected to grow along population growth, that is about 4% per year. Although this assumption supposes an inflexion of the current trend, it seems a fair one, for land revenues could be increased as the mobility system would develop and enhance economic activities. The capacity of the city to recover taxes and revenues is a also a credible assumption given its current organization.
- The **Road Fund** from Federal Government could keep increasing to its current pace (10% per year) although this assumption is not considered in all financing scenarios.
- The **IDA funds** delivered by the World Bank through the UIIDP program could follow an annual growth of 4%, as a long-term assumption (annual growth of the IDA contribution over the past 3 years was about 10%).

Potential related to new financing sources are estimated according to their scope of relevance, as previously described, but also to the logic underlying the financing scenarios that are presented in chapter **Erreur ! Source du renvoi introuvable.**. These scenarios proposed a different balance between City own funds and external funds.

| | City Administration | Federal Government | World Bank | Other IFIs | Private sector |
|---|---|---|---|---|---|
| **Sources** | Sale of goods & services<br>Land revenues<br>Taxes | Road fund | IDA | Interest from other IFIs to finance the SUMP, including the AFD | Private concession proposed for some roads |
| **Contribution to the transport budget in 2019** | **7 MEUR** | 0,2 MEUR | **2,6 MEUR** | | |
| **Potential contribution (annual average)** | Up to **10,6 MEUR** | **0,3 MEUR**<br>**4,6 MEUR**<br>(NIP dotation) | **4,3 MEUR** | **6 MEUR**<br>3,3 MEUR from AFD | **1 MEUR** |
| **Expected evolution** | Land revenues to increase with PT development (10%)<br>Taxes to increase with urban population (4%)<br>PT commercial revenues as a funding source | dotation for the New Industrial Park infrastructures and utilities | | Up to 80% of PT and NMT interventions | Eastern bypass and Toll Plaza road developments |
| | | | **IFIs** | | |

**Potential contribution (annual average) per financing source**

## Funding sources

The estimation of public transport revenues relies on the demand forecast for future horizons produced by the demand model of Dire Dawa as well as a flat fare assumption detailed per time horizon. The latter has been established under a strict condition of affordability, considering that:

- Before the pandemic, Bajaj fares were high enough to restrain demand, as reported by Bajaj users through a dedicated focus group, even though the focus group participants were employees and therefore not representative of the most vulnerable part of the population. By then Bajaj fare were comprised between 3 and 5 ETB.
- a 10 to 15% share of the monthly household income dedicated to mobility is commonly recognized as an affordability threshold. In the present estimation, the target fare is set to comply with a 9% threshold, assuming that the monthly household income raises along with national GDP.

Resulting revenues dramatically raise on the last programming period, with the completion of the BRT network. Considering the disruptive character of the foreseen city development and the uncertainty induced over the modelling results, it is interesting to note that a certain margin remains through the possibility to increase the public transport fare.

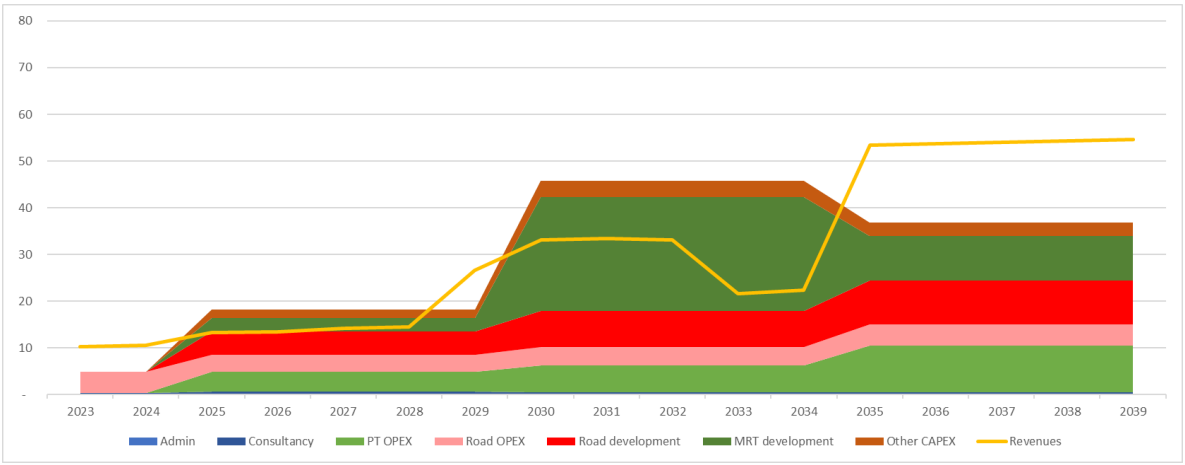
| | 2019 | Short term (2025) | Mid term (2030) | Long term (2040) |
|---|---|---|---|---|
| **Ridership** | | 151 000 | 220 190 | 737 000 |
| **Fare (ETB)** | 3 to 5 before COVID<br>6 to 10 in 2020 | 3 | 4 | 6 |
| **Daily revenues (ETB)** | | 453 000 | 880 760 | 4 422 000 |
| **Annual revenues (ETB)** | | 135 900 000 | 264 228 000 | 1 326 600 000 |

**Assumptions regarding public transport revenues**

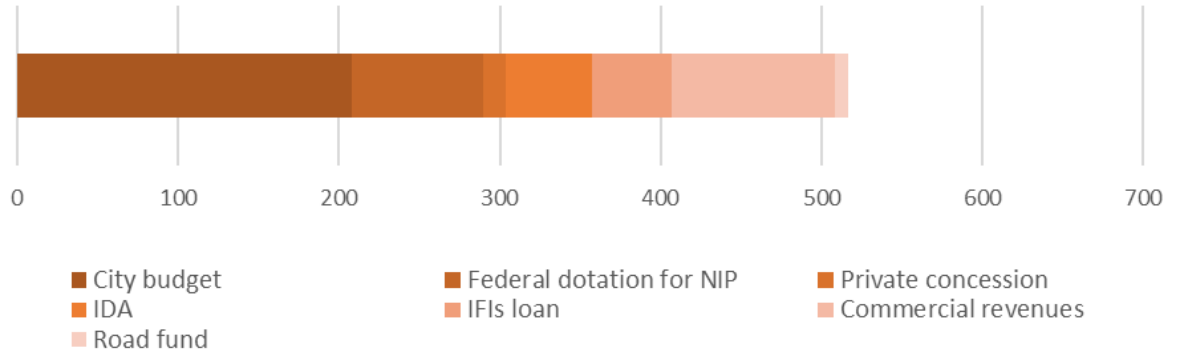
Benefits generated by public transport operation are reinvested into public transport investments.

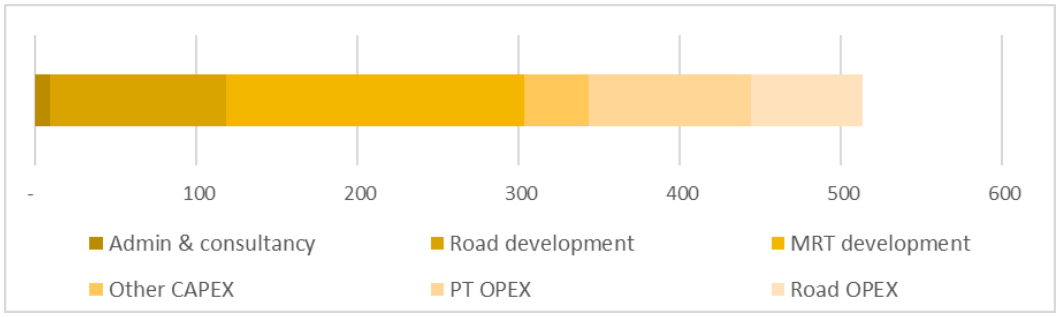
## 5.3.2. Financing plan

Overall resources are 517 M€ and overall expenses are 514 M€ (335 M€ CAPEX and 179 M€ OPEX). The City participation reaches 23% of the total revenues. The City annual budget is almost evenly distributed between investment and operation expenditures.




**SUMP budget and resources (CAPEX and OPEX)**




**Distribution of revenues (top) and expenses (bottom)**

## 5.3.3. Implementation schedule

### Overall schedule

The overall schedule of the SUMP is presented below. Four distinct periods of time as sequenced for its implementation:

- Preparation phase – 2023-2024
- SUMP short term program (1) 2025-2029
- SUMP medium term program (2) 2030-2034
- SUMP long term program (3) 2035-2039

| # | N | OBJECTIVE | N° | ACTION NAME | PREPARATION | | SHORT TERM SUMP PROGRAM | | | | | MID TERM SUMP PROGRAM | | | | | LONG TERM SUMP PROGRAM | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 |
| 1 | 1 | road network | 1.A.1 | Main road projects | | | | | | | | | | | | | | | | | |
| 2 | | | 1.A.2 | Micro road projects | | | | | | | | | | | | | | | | | |
| 3 | | | 1.B.1 | Road design guidelines | | | | | | | | | | | | | | | | | |
| 4 | | | 1.B.2 | Road maintenance plan | | | | | | | | | | | | | | | | | |
| 5 | | | 1.C.1 | Target road and crossroad network | | | | | | | | | | | | | | | | | |
| 6 | 2 | road management | 2.A.1 | Road axis upgrade projects | | | | | | | | | | | | | | | | | |
| 7 | | | 2.A.2 | Traffic and mobility management | | | | | | | | | | | | | | | | | |
| 8 | | | 2.C.1 | Circulation plan | | | | | | | | | | | | | | | | | |
| 9 | | | 2.D.1 | Traffic management unit | | | | | | | | | | | | | | | | | |
| 10 | 3 | paratransit | 3.A.1 | Paratransit structuration and development | | | | | | | | | | | | | | | | | |
| 11 | | | 3.B.1 | Quality of service targets | | | | | | | | | | | | | | | | | |
| 12 | | | 3.C.1 | Paratransit Transition Plan | | | | | | | | | | | | | | | | | |
| 13 | | | 3.E.1 | Paratransit capacity reinforcement | | | | | | | | | | | | | | | | | |
| 14 | 4 | mass transit | 4.A.1 | Bus network development | | | | | | | | | | | | | | | | | |
| 15 | | | 4.A.2 | BRT development | | | | | | | | | | | | | | | | | |
| 16 | | | 4.C.1 | Mass transit development plan | | | | | | | | | | | | | | | | | |
| 17 | | | 4.D.1 | Mass transit fare integration | | | | | | | | | | | | | | | | | |
| 18 | 5 | NMT | 5.A.1 | NMT projects | | | | | | | | | | | | | | | | | |
| 19 | | | 5.A.2 | Bikes for all | | | | | | | | | | | | | | | | | |
| 20 | | | 5.B.1 | NMT integration in transport projects | | | | | | | | | | | | | | | | | |
| 21 | | | 5.C.1 | NMT development plan | | | | | | | | | | | | | | | | | |
| 22 | | | 5.E.1 | Pedestrian-centered approach | | | | | | | | | | | | | | | | | |
| 23 | | | 5.F.1 | Walking in Dire Dawa | | | | | | | | | | | | | | | | | |
| 24 | 6 | urban logistics | 6.A.1 | Freight terminals | | | | | | | | | | | | | | | | | |
| 25 | | | 6.A.2 | Urban logistics projects | | | | | | | | | | | | | | | | | |
| 26 | | | 6.C.1 | Urban logistics development plan | | | | | | | | | | | | | | | | | |
| 27 | | | 6.D.1 | Urban logistic manager | | | | | | | | | | | | | | | | | |
| 28 | 7 | integrated transport | 7.A.1 | Transport hubs | | | | | | | | | | | | | | | | | |
| 29 | | | 7.B.1 | Sustainable mobility planning process | | | | | | | | | | | | | | | | | |
| 30 | | | 7.B.2 | Mobility data management | | | | | | | | | | | | | | | | | |
| 31 | | | 7.B.3 | SUMP evaluation | | | | | | | | | | | | | | | | | |
| 32 | | | 7.C.1 | Multimodality strategy | | | | | | | | | | | | | | | | | |
| 33 | | | 7.C.2 | Energy-wise mobility | | | | | | | | | | | | | | | | | |
| 34 | | | 7.C.3 | Demand management | | | | | | | | | | | | | | | | | |
| 35 | | | 7.D.1 | Integrated Transport Authority | | | | | | | | | | | | | | | | | |
| 36 | | | 7.D.2 | Integrated Mobility financing | | | | | | | | | | | | | | | | | |
| 37 | | | 7.E.1 | Sustainable mobility project management | | | | | | | | | | | | | | | | | |
| 38 | | | 7.E.2 | Inclusive, green and gender aware mobility | | | | | | | | | | | | | | | | | |
| 39 | | | 7.F.1 | Inclusive, green and gender aware mobility | | | | | | | | | | | | | | | | | |
| 40 | 8 | sustainable integration | 8.A.1 | TOD projects opportunities | | | | | | | | | | | | | | | | | |
| 41 | | | 8.B.1 | TOD guidelines | | | | | | | | | | | | | | | | | |
| 42 | | | 8.C.1 | TOD development plan | | | | | | | | | | | | | | | | | |

## Steps of the SUMP per programming periods

| | 2023 – 2024<br>Preparation phase<br>2 years | 2025 – 2029<br>Short term program (1)<br>5 years | 2030 – 2034<br>Mid-term program (2)<br>5 years | 2035 – 2039<br>Long-term program (3)<br>5 years |
|---|---|---|---|---|
| **KEY SUMP OBJECTIVES** | ▪ Get organized and prepared for SUMP implementation by setting up teams and processes and operational targets. | ▪ Kick start sustainable mobility projects in the current urban area of Dire Dawa with upgraded road network, restructured paratransit and a first set of bus line. | ▪ Support the extension of the city and the development of the New Industrial Park (NIP) with extended and upgraded road network, structured and upgraded paratransit, a mature bus network and a first BRT line. | ▪ Provide a wide array of sustainable mobility solutions in a new scale fully polycentric city articulated to a mass transit BRT backbone |
| **TARGET ACHIEVEMENTS** | ▪ Set up of the SUMP steering team (Mobility Committee) gathering the City and Federal administrations (FTA, RTA)<br>▪ Set up of the core SUMP technical team<br>▪ Define a set of strategic and operational documents and roadmaps to support SUMP project implementation<br>▪ Adopt a roadmap of actions and projects for the Short term SUMP priority program (2025-2029)<br>▪ kick start the reporting process (indicators) for mobility analysis and SUMP follow up | ▪ Mobility Committee in cruising speed regarding SUMP follow up and decision making<br>▪ Support of the City of Dire Dawa for the definition of a national legal frame for Transport Authorities<br>▪ Support the development of the SUMP core Technical Team with adequate resources and capacity building measures<br>▪ Implementation of the first program of SUMP actions with adequate and test interventions and processes<br>▪ Awareness raising activities with the citizens of Dire Dawa and association to projects in stakeholder engagement activities | ▪ Creation of the Transport Authority from the Mobility Committee in application of a possibly new national legal frame<br>▪ Development of the Transport Authority technical team on PT operation aspects (service definition, contract management)<br>▪ SUMP core technical team in cruising speed and working in full interfaces with other departments and stakeholders<br>▪ Deepened awareness raising activities with the citizens of Dire Dawa, association to projects in stakeholder engagement activities<br>▪ Mature project monitoring and basis for a mobility observatory | ▪ Fully mature Transport Authority responsible of public transports (Paratransit, buses, BRT) and according to operation contracts<br>▪ BRT + bus operator working under Transport Authority to supply PT services<br>▪ SUMP core technical team in cruising speed and working in full interfaces with other departments and stakeholders<br>▪ Stakeholder engagement activities as a routine in strategies and project development<br>▪ mature project monitoring and fully operant mobility observatory |

| | | | | |
|---|---|---|---|---|
| | | ▪ Development of project monitoring and of mobility indicators | | |
| **CAPACITY BUILDING** | ▪ Support to decision making on mobility transversal aspect for decision makers in the Mobility Committee<br>▪ Support to SUMP core team kick off<br>▪ support to the development of monitoring and evaluation capacities (preliminary) | ▪ Support for mobility decision makers<br>▪ Support for mobility project management (preliminary) for SUMP core team + focused other program implementers<br>▪ support to the development of transversal mobility management processes to increase the impact and value of projects (e.g. NMT dimension systematically raised in road projects, assessment of mobility impacts of urban projects, etc.)<br>▪ support to the development of monitoring and evaluation capacities (preliminary)<br>▪ support for conducting stakeholder engagement in strategies and projects (preliminary) | ▪ Support for mobility decision makers<br>▪ Support for mobility project management (advanced) for SUMP core team + associated program implementers<br>▪ support to the development of transversal mobility management processes<br>▪ Support for the development of focused key capacities (financial, legal, PT operation management, contract management, etc.)<br>▪ support to the development of monitoring and evaluation capacities (advanced)<br>▪ support for conducting stakeholder engagement in strategies and projects (advanced) | ▪ Support for mobility decision makers<br>▪ Support for mobility project management (advanced) for SUMP core team + associated program implementers<br>▪ support to the development of transversal mobility management processes<br>▪ Support for the development of focused key capacities (financial, legal, PT operation management, contract management, etc.)<br>▪ support to the development of monitoring and evaluation capacities (advanced)<br>▪ support for conducting stakeholder engagement in strategies and projects (advanced) |
| **AWARENESS RAISING AND EMPOWERMENT** | ▪ Information events on sustainable mobility and SUMP projects | ▪ Information events on sustainable mobility and SUMP projects<br>▪ Consultation of stakeholders in a number of SUMP projects<br>▪ Specific NMT projects with citizens | ▪ Information events on sustainable mobility and SUMP projects<br>▪ Consultation of stakeholders in a number of SUMP projects, especially the BRT project<br>▪ Specific NMT projects with citizens | ▪ Information events on sustainable mobility and SUMP projects<br>▪ Consultation of stakeholders in a number of SUMP projects, especially the BRT project<br>▪ Specific NMT projects with citizens |

## 5.4. Governance

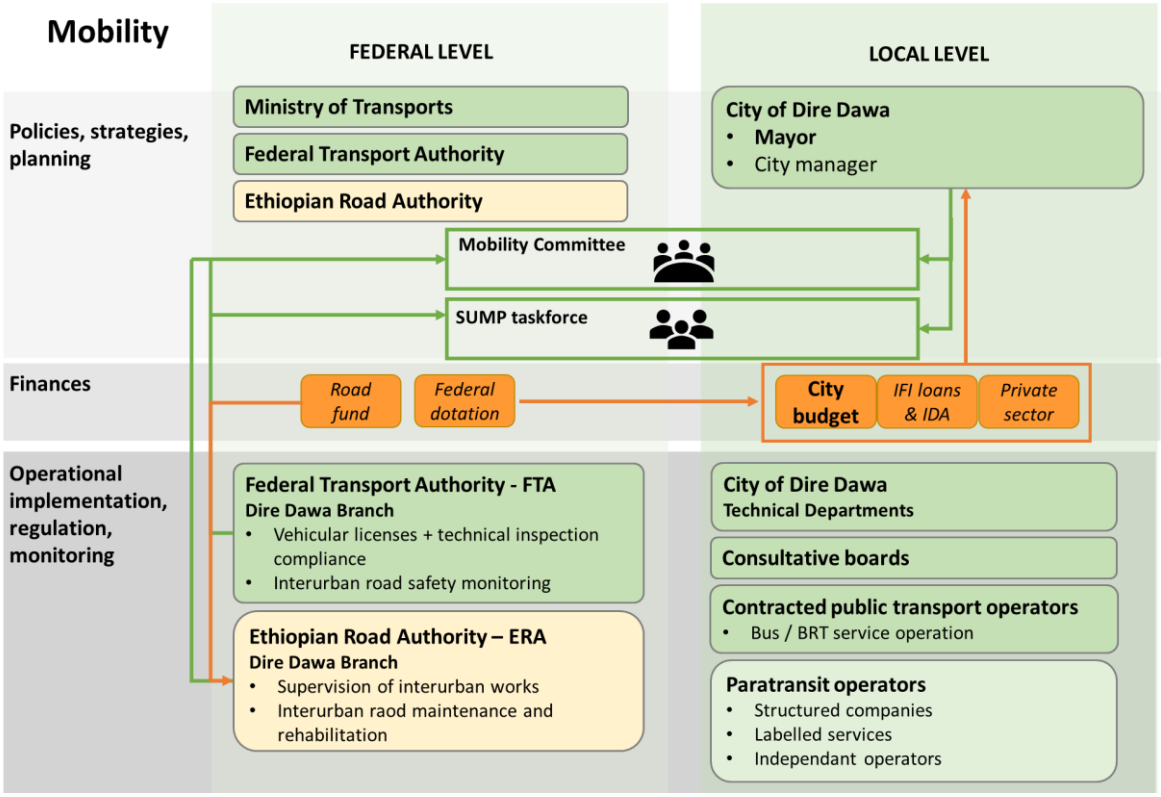
The implementation of the SUMP relies on two distinct bodies:

- **An institutional body**, the **Transport Authority**, competent for transport and mobility topic over the whole metropolitan area of Dire Dawa, meaning the current City area but possibly in the future an increased area encompassing the New Industrial Park. The **Transport Authority** associates all authorities currently competent in the field of transport, namely the City of Dire Dawa City, the Federal Transport Authority (FTA) and the Ethiopian Road Authority (ERA). Once a national legal frame allowing the creation of a Transport Authority implemented, participation authorities give out their competences and revenues to the new Transport Authority over the metropolitan area and are included in exchange in the decision steering of the Transport Authority. Transport Authority is an integrated institutional body responsible for mobility organisation and management, for transport infrastructure investments and maintenance as well as transport services investments and operation. This scope of competence includes road, public transports, non-motorized transports, as well as interfaces with urban and economic development. Its missions encompass all political and administrative aspects, including financing and contract management.
- **A technical body,** the **SUMP taskforce,** competent for the SUMP implementation, follow-up, and evaluation, under the authority of the integrated mobility authority. It is in charge of the examination of the SUMP projects, although with no power of decision.

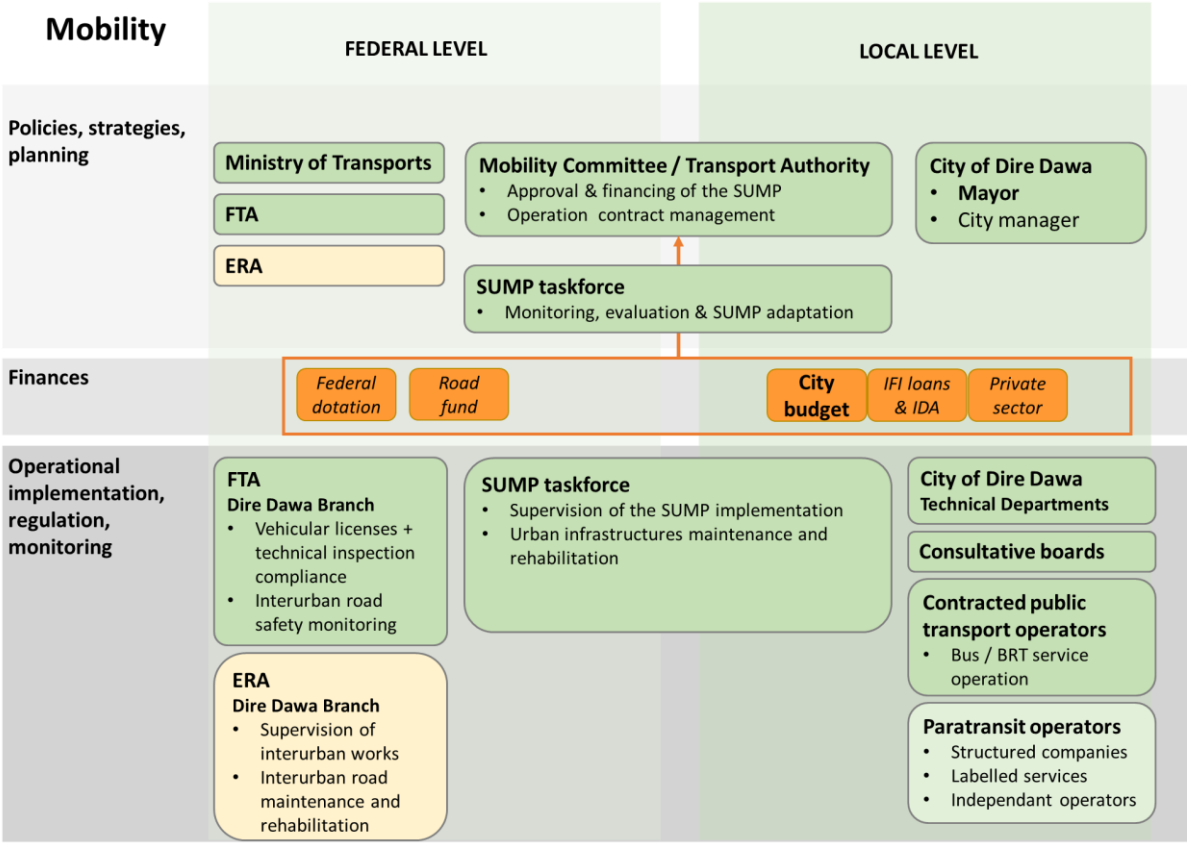
The transition proposed toward an integrated mobility authority considers two steps:

- The establishment of a **Mobility Committee**, that brings the existing authorities together, under a commitment to manage transport and mobility related cases in a concerted and informed manner. It is an operational solution allowing to work right now in an integrated manner under the current legal framework. The missions and objectives of the Mobility Committee are specified in a letter of intent signed and supported by all its members. Thus, the first embodiment of Dire Dawa mobility authority contemplates a very simple and practical framework. The challenge lie in the capacity to have an open discussion, speak a common language, welcome external point of views and accept to review the investment priorities of each member in that manner. A prerequisite for an efficient collaboration is a good awareness of the SUMP objectives and measures by members, as well as a strong political support of the SUMP from the Mayor and from federal level. SUMP dissemination activities should then be organized soon after the creation of the Mobility Committee. Capacity building and workshops can also help to overcome technical barriers. At the same time, the target scheme shall be kept in mind, with the perspective of a fully integrated governance and financing.
- When the scale of SUMP projects will require to have an autonomous legal and financial entity to steer them, the Mobility Committee will eventually turn into a full fledge **Transport Authority**. The introduction of mass transit figures a milestone in that regard, as it requires capacities to contract with operators, to raise revenues and possibly give some subsidies. This does not impact the resources needed and foreseen organization of the SUMP Taskforce. However, former technical members of the SUMP taskforce will be officially transferred from their original administration to the newly established authority, while both the City and Federal governments would sit in its board.

These elements are presented in the action sheet 7.D.1, Integrated Transport Authority.




Mobility governance and financing under the Mobility Committee




Mobility governance and financing under the integrated Transport Authority

## 5.5. Capacity development strategy

### SUMP taskforce manpower

The foreseen organization of the SUMP taskforce is presented hereafter. It is expected to gather professionals currently in charge of mobility planning, transport operation, urban planning or land use in current administrations as well as new external resources hired for the purpose.

Indeed, the first component is key to capitalize on knowledge and experience, although it may not be able to transcend existing organization by its own. New resources are thus needed to bring external point of view and complementary skills. In that respect, it is worth mentioning that the costing detailed in chapter 5.2**Erreur ! Source du renvoi introuvable.** assumes relatively high income, for the City to be able to attract talent, well-educated and possibly with international experience.

The transport sector mobilizes about 275 persons for Dire Dawa Region, among which 55 are strictly dedicated to the urban area (although it should be noted that Dire Dawa concentrate most of the infrastructures and services).

As for the SUMP taskforce, manpower needs can be detailed as follow, considering:

- Up to 4 operational project followed-up by one project manager, except from the BRT that require different profiles rather than one person per line. In the present estimate, three profiles have been assumed to cover three different topics: infrastructure, systems and operation design.
- Synergies between areas to optimize the workforce. Typically, personnel assigned to road network and road traffic management could form one pool of resource. The same goes for integrated transport and sustainable integration.
- Involvement of the SUMP management team into actions falling into objective 7, Integrated transport. Especially, the following actions are assumed to be directly handled by the SUMP management team: Sustainable mobility planning process, Mobility data management, SUMP evaluation, Integrated Transport Authority, Integrated mobility financing, and Inclusive, green and gender aware mobility.

| Team | Preparation | short term | mid term | long term |
|---|---|---|---|---|
| SUMP management | 4 | 4 | 4 | 4 |
| Objective management | 7 | 10 | 13 | 14 |
| Project management | 7 | 11 | 11 | 12 |
| **Total** | **18** | **25** | **28** | **30** |

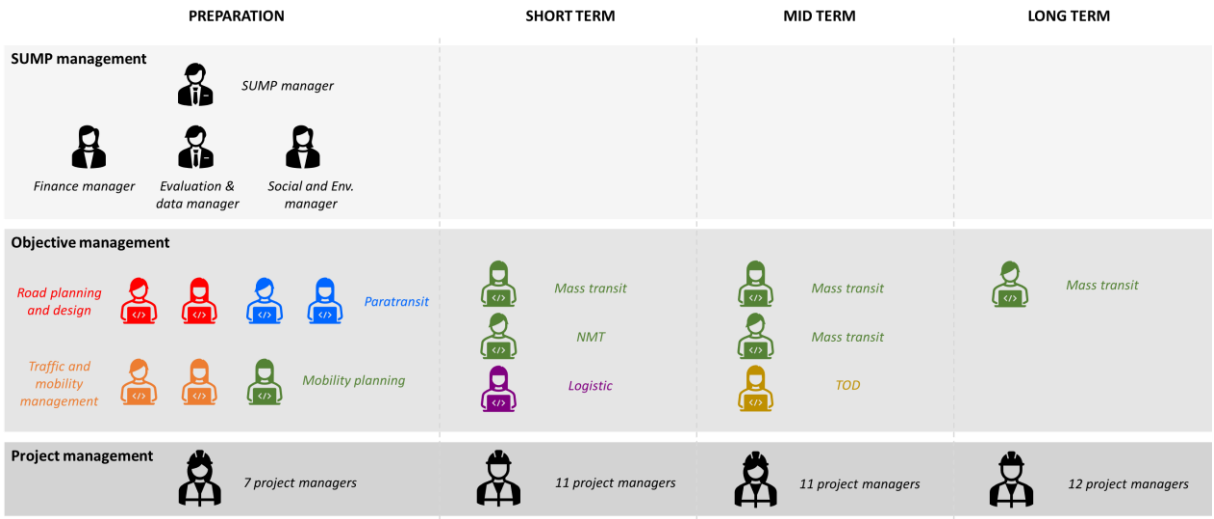
**Estimate of SUMP taskforce personnel per horizon (full time position per year)**

### SUMP taskforce internal organization

The SUMP taskforce is structured around three management levels:

- **The top management**, who is accountable for the SUMP progress, the sound management of SUMP resources and the compliance to the SUMP principles, as for social inclusion and environment. It is set right after the SUMP adoption.

- **The middle management**, composed of technical specialist of the relevant areas of the SUMP. They are here represented as per SUMP objectives. These technical experts oversee the actions related to their field. They also bring technical assistance to the operational team and are responsible for knowledge management. This team should develop between the preparation phase and the first programming period, in relation with the action plan schedule.
- **The operational level**, that cares for the operational projects on a daily basis. The corresponding workforce thus varies according to the number of projects to be implemented over one programming period, considering that one person can follow-up a limited number of projects at a time.




SUMP taskforce organization

Existing functions related to operation and maintenance management remain in their current organization. This team is also to be strengthened according to current sizing key (e.g., linear or area per professional).

Capacity building is another requirement to overcome current shortages and achieve an efficient asset management.

## Capacity building

Beyond technical expertise in related fields, the action plan emphasizes the need to strengthen the capacities of the SUMP taskforce in three specific areas (see below).

| OBJ. ID | OBJECTIVE short | ACTION ID | ACTION NAME | MAIN TOPICS |
|---|---|---|---|---|
| 5 | NMT | 5.E.1 | Pedestrian-centered approach | Walking demand and uses<br>Components of the walking system<br>Planning & design methods for inclusive NMT facilities<br>Data collection & indicators for NMT |
| 7 | integrated transport | 7.E.1 | Sustainable mobility project management | Project development steps (opportunity, concept and feasbility, design)<br>Procurement preparation and management<br>Demand modelling<br>Transport network design<br>Urban integration and alignment<br>Costing & scheduling<br>Operation & maintenance |
| 7 | integrated transport | 7.E.2 | Inclusive, green and gender aware mobility | Energy transition<br>Environmental impact assessment<br>Social impact assessment<br>Gender related challenges and levers<br>Social inclusion and social fares in public transports<br>Marketing approach<br>Data collection & indicators for environment, social inclusion and gender |

### Capacity building planned as part of the SUMP

More generally, capacity strengthening is a continuous process to be fostered by the middle management. Partnership with the national government or peer cities from the continent could also be encouraged to favour capacity building, as well as exchange with the MobiliseYourCity Community of Practice. Besides, the plan contemplates the possibility to integrate capacity building into the consultancies related to “Process & guidelines” and “Policies & strategies” actions.

| OBJECTIVE short | ACTION TYPE | ACTION ID | ACTION NAME |
|---|---|---|---|
| road network | Process & guidelines | 1.B.1 | Road design guidelines |
| road network | Process & guidelines | 1.B.2 | Road maintenance plan |
| road network | Policies & strategies | 1.C.1 | Target road and crossroad network |
| road management | Process & guidelines | 2.A.2 | Traffic and mobility management |
| road management | Policies & strategies | 2.C.1 | Circulation plan |
| paratransit | Process & guidelines | 3.B.1 | Quality of service targets |
| paratransit | Policies & strategies | 3.C.1 | Paratransit Transition Plan |
| mass transit | Policies & strategies | 4.D.1 | Mass transit fare integration |
| NMT | Process & guidelines | 5.B.1 | NMT integration in transport and mobility projects |
| NMT | Policies & strategies | 5.C.1 | NMT development plan |
| urban logistics | Policies & strategies | 6.C.1 | Urban logistics development plan |
| integrated transport | Process & guidelines | 7.B.2 | Mobility data management |
| integrated transport | Policies & strategies | 7.C.1 | Multimodality strategy - physical and functional aspects |
| integrated transport | Policies & strategies | 7.C.2 | Energy-wise mobility development |
| integrated transport | Policies & strategies | 7.C.3 | Demand management |
| sustainable integration | Process & guidelines | 8.B.1 | TOD guidelines |
| sustainable integration | Policies & strategies | 8.C.1 | TOD development plan |

### Actions meant to support the SUMP taskforce capacity building

# 6. Monitoring and reporting

The evaluation of the SUMP is essential to the success of the plan itself, as it allows to demonstrate the impact of the actions undertaken and therefore the efficiency of the SUMP in reaching its objectives. Mobility may be also affected by various external factors, such as national policy, financing or regulatory framework, socioeconomic context, etc. The regular measurement of indicators allows to detect any exogenous phenomenon that could occur and impact SUMP implementation and adapt the strategy accordingly.

Being for improving the approach or adapting to an evolving context, the SUMP needs to be updated on a regular basis, along with policies & strategies developed for each SUMP objectives. Updating the SUMP may consist in reassessing, reworking and rescheduling measures. New measures may also be introduced as needed, to address emerging issues. In any case, a process shall be defined to track changes and conserve the objective and consensual character of the SUMP. Legitimacy and awareness being pre-requisites for political endorsement and effective implementation, a formal approval shall be achieved at technical and political level, respectively for measures or SUMP adaptation.

In practice, the SUMP monitoring and evaluation considers 2 levels:

- **General objectives of the SUMP**, that are related to macro indicators, including core ones, often based on the results of the 2020 household survey,
- **SUMP action results**, qualified by specific indicators, as detailed in the action sheets, that may require particular surveys, usually simpler than the household survey.

## 6.1. Core indicators

The impact indicators or so-called “core indicators” as defined by the MobiliseYourCity partnership aim to assess the sustainable character of a SUMP. They can be related to the ambitions of the SUMP of Dire Dawa.

**AMBITION 1**
**A mobility system supporting a high quality urban growth**

- NMT modal share
- Traffic fatalities

**AMBITION 2**
**Connected and integrated city for all citizens and districts**

- PT modal share
- PT network coverage

**AMBITION 3**
**Carbon-wise mobility solutions**

- GHG emissions per year per inhabitant
- Reduction of yearly GHG emissions

**AMBITION 4**
**A mobility system for economic attractivity and insertion in global flows**

- Average time dedicated to mobility daily
- Average expenses dedicated to mobility daily

**Core indicators as per the ambitions of the SUMP of Dire Dawa**

Most of the impact indicators are based on information from the household survey. Due to the complexity of the household survey and its related cost of implementation, this type of survey is generally contemplated by decade. For that reason, the SUMP evaluation considers a larger time frame than the

evaluation of actions. Typically, SUMP evaluation may be conducted every 5 or 10 years, whereas action evaluation would rather be conducted on a yearly basis, according to the actions yet under implementation.

Target values for the indicators considered in the SUMP evaluation figure in the table below.

| Indicator | Modes | Unit | Perimeter | Period | Baseline | BAU scenario | SUMP target | Note |
|---|---|---|---|---|---|---|---|---|
| **Vision and impact related indicators** | | | | | | | | |
| modal share of NMT | NMT | % | DDW inhabitants | 10 years | 46% | 40% | 44% | While the SUMP intends to develop the use of bike in Dire Dawa, no target can be reasonably set for this specific mode as thecurrent use is insignificant. Thus, the NMT modal share is set to the walking modal share. On the other hand, other indicators are proposed to monitor actions promoting bike and in particular action 5.A.3. |
| modal share of public transports | BRT, bus, local | % | DDW inhabitants | 10 years | 42% | 43% | 45% | |
| disposable average income spent on public transport | all | % | DDW inhabitants | 10 years | 12% | 10% | 9% | |
| GHG emissions per year per inhabitant | all | CO2 eq per year per inhab. | DDW | 10 years | 27 | 47 | 28 | |
| traffic fatalities | all | fatalities per year | DDW | Yearly | 31 | | | 2018 value considered for the baseline. While there is no adequate method to estimate a long term value, the target should be zero, although the number of vehicle.km is expected to increase by 4,6 between the basline and the future scenario. |
| PT network coverage | PT | % | DDW transport network | 5 years | 84% | 58% | 86% | Not that the urban area - and therefore the base for calculation - is extended by 114 km² in the BAU scenario and 41 km² in the target scenario |
| average time dedicated to mobility daily | all | minutes | DDW inhabitants | 10 years | 45 | 71 | 65 | |
| average expense dedicated to mobility daily | all | ETB | DDW inhabitants | 10 years | 8,8 | 9,2 | 8,7 | |
| average travel time per day | all | minutes | DDW inhabitants | 10 years | 45 | 71 | 65 | |
| average distance per day | all | km | DDW inhabitants | 10 years | 4,7 | 6,8 | 7,5 | |
| **Investment indicators** | | | | | | | | |
| km of roads | na | km | DDW transport network | anual | 697 | 915 | 834 | |
| km of primary roads | na | km | DDW transport network | anual | 81 | 106 | 113 | |
| km of secondary roads | na | km | DDW transport network | anual | 18 | 81 | 88 | |
| km of tertiary roads | na | km | DDW transport network | anual | 18 | 187 | 118 | |
| additional km of primary roads | na | km | DDW transport network | anual | 0 | 25 | 32 | |
| additional km of secondary roads | na | km | DDW transport network | anual | 0 | 63 | 70 | |
| additional km of tertiary roads | na | km | DDW transport network | anual | 0 | 169 | 100 | |
| % of primary roads | na | % | DDW transport network | anual | 12% | 12% | 14% | |
| % of secondary roads | na | % | DDW transport network | anual | 3% | 9% | 11% | |
| % of tertiary roads | na | % | DDW transport network | anual | 3% | 20% | 14% | |
| km BRT lines | BRT | km | DDW transport network | anual | 0 | 0 | 30 | |
| km bus lines | bus | km | DDW transport network | anual | 0 | 44 | 76 | |
| km local lines | local | km | DDW transport network | anual | 70 | 62 | 34 | |
| total km PT lines | BRT, bus, local | km | DDW transport network | anual | 70 | 106 | 140 | |
| average travel time per trip | all | minutes | DDW inhabitants | 10 years | 25 | 39 | 36 | |

**Core indicators values as estimated for the baseline (2020), the business-as-usual scenario and the target vision**

## 6.2. Other indicators

Each action of the SUMP comes with indicators meant to monitor output, outcome and impact:

- Output indicators enable to measure the implementation progress of an action
- Outcome indicators enable to measure the direct consequences of an action
- Impact indicators enable to measure the global impact induced by an action's results

All the indicators are listed in the appendix 7.7. It details the indicators definition, unit, type, perimeter, level of desegregation, evaluation frequency, data collection and computation methods. It thus provides specific guidance to conduct the monitoring process.

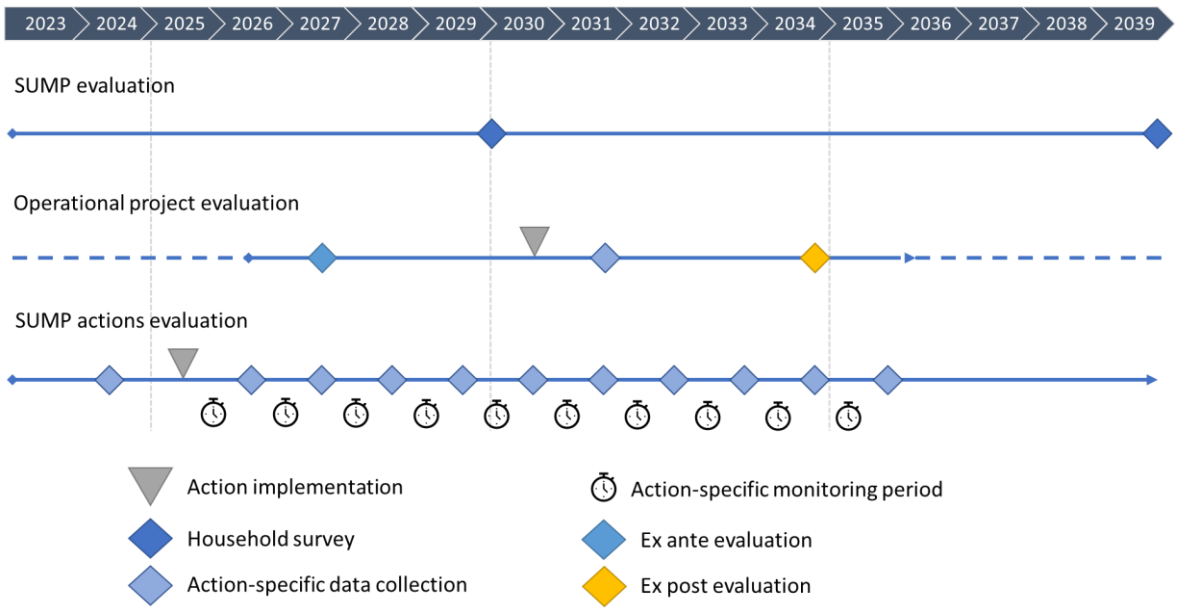
Many of the proposed indicators rely on the household survey, meaning that the original household survey design should be taken as a reference to elaborate information meant to be compared to these indicators. Especially, the geographical perimeter (e.g., Dire Dawa City current boundaries) and the target (Dire Dawa inhabitants' mobility on a base day) will be born in mind whenever the household survey is used as a comparative material.

## 6.3. Monitoring management

The monitoring process encompasses the data collection and processing, aimed to feed the indicators database presented in appendix. Technical staff is dedicated to this process and is responsible for:

- **Data collection** : depending on the information needed to implement the monitoring protocol delivered jointly with the SUMP, a data collection strategy is elaborated that specifies the surveys to be implemented by the Transport Authority itself, as well as data to be provided by partners such as operators or administrations. Related budget and schedule shall be detailed according to the action plan so that data are issued in a timely manner, enabling for punctual evaluation.
- **Data analysis & indicators computation** : once that data reliability and consistency have been ensured, indicators are calculated according to the monitoring protocol (see in appendix). If the protocol can be adapted to fit with operational conditions, it is important that calculation methods are documented to assured that indicators are consistent over time and can be compared to track for long term evolution.
- **Database administration** : particular attention shall be paid to data storage methods and tools. They should be designed to support the SUMP monitoring over the implementation period and beyond. Technical capacities and resources are also likely to determine the type of technology involved. As a basic requirement, it should be resilient to change, meaning a qualified person should be able to get familiar with the system quite easily if the original person in charge is leaving.

The SUMP evaluation consists in valuing indicators on defined milestones to support decision-making regarding the SUMP actions and overall strategy. The different evaluation timescales are schematically represented on the figure below (indicative).



**SUMP evaluation timescales**

The evaluation process involves stakeholders dialogue, to share the results and agree upon success or failure factors, as well as corrective actions or adaptations to be considered. Evaluation milestones also bring opportunities to communicate about the SUMP implementation, toward both stakeholders and the general public:

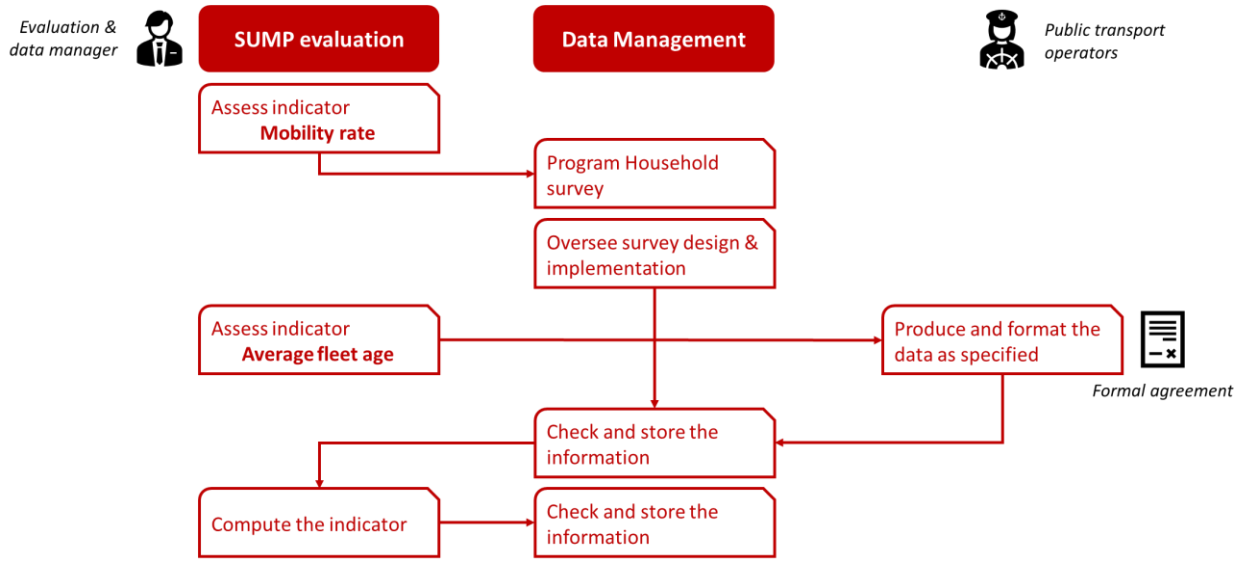
- As for **action evaluation**: punctual communication may be contemplated if relevant, according to the magnitude of the action. Relevant communication forms are press release, social network post, etc.
- As for the **SUMP evaluation**: evaluation results and outcomes shall be presented, highlighting the achievement of the SUMPs and lessons learned. In addition to web or press publication, public meeting, public exhibition or mobility fair may also be relevant, to reach a broader public.

Due to the collaborative nature of monitoring and evaluation processes, communication is important to raise awareness among stakeholders and ensure a good understanding of the nature and format of the information required. In some ways, it also supports the dissemination of the SUMP content among mobility stakeholders.

In the same line, data sharing among mobility stakeholders may be supported by different means:

- **Incentives** : obtaining information from organizations that are unformal or not yet professionalized may be difficult, as there is no contractual framework to rely on. Ad hoc agreements can be proposed, jointly with associated benefits such as capacity building or advertisement of the results to be obtained thanks to the exchanged information. As for Paratransit, the quality of service charter/commitment can feature requirements regarding data collection and sharing.
- **Operation contracts** : once operators have got transformed into structured companies, expected data will be specified into the contract established with public authorities.

The needs of data derived from the evaluation will be integrated into each action and the production cost distributed among mobility stakeholders.




**Indicative workflow**

# 7. Appendix

## 7.1. List of contributors to the SUMP development

| Name | Organisation | Department | Function | SC[10] | TC[11] |
|---|---|---|---|---|---|
| **Kedir Jawar** | City of Dire Dawa | | Mayor (since2021) | X | |
| **Ahmed Mohammed Bouh** | City of Dire Dawa | | Mayor (until 2021) | X | X |
| **Abduselam Mohammed Ebrahim** | City of Dire Dawa | City Manager Office | City Manager | X | X |
| **Abduljawad Mohammed Ahmed** | City of Dire Dawa | City Manager Office | City Manager | X | X |
| **Alemayehu Kebede** | City of Dire Dawa | Construction Bureau/Building permit | | | |
| **Dereje Tsegaye** | City of Dire Dawa | Dire Dawa Road Authority | Office Head | | X |
| **Amanuel Fesseha** | City of Dire Dawa | Finance & Economic development | Deputy Bureau Head | | |
| **Girma Tessema** | City of Dire Dawa | Finance & Economic development | Director | | X |

[10] Steering Committee

[11] Technical Committee

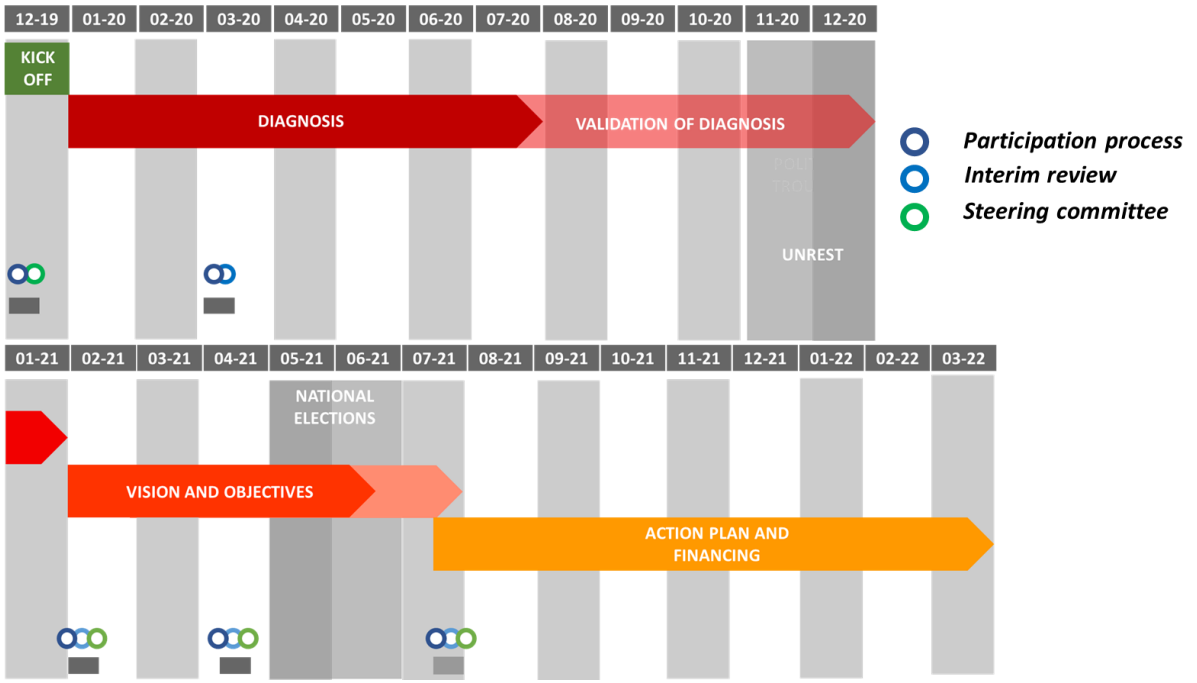
| | | | | | |
|---|---|---|---|---|---|
| **Kefele Gna** | City of Dire Dawa | Finance & Economic development | | | |
| **Haile Dade** | City of Dire Dawa | Finance & Economic development | | | |
| **Sultan Aliyi** | City of Dire Dawa | Finance & Economic development | Bureau Head | X | |
| **Gebeyo** | City of Dire Dawa | Land Development & Management Bureau | Bureau Head | X | |
| **Melsew Zenebe** | City of Dire Dawa | Land Development & Management Bureau | | | |
| **Tilahun Derese** | City of Dire Dawa | Land Development & Management Bureau | | | |
| **Tezera Bekele** | City of Dire Dawa | Land Development and Management | | | |
| **Fethi Ahmed** | City of Dire Dawa | UIIDP | | | |
| **Efti Abdurahma** | City of Dire Dawa | UIIDP | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Ali Abedid** | City of Dire Dawa | Urban planning | Director | X | X |
| **Alemayo Mokenen** | City of Dire Dawa | Urban planning | Expert | | X |
| **Firew Abebe** | City of Dire Dawa | Urban planning | Expert | | |
| **Biniam Gitinsai** | City of Dire Dawa | Dire Dawa Urban plan revision project | Director | X | X |
| **Tensay Mengistu** | City of Dire Dawa | City bus | Director | | X |
| **Bayen Adem** | City of Dire Dawa | City bus | Bus expert | | X |
| **Inspector Anteneh Refera** | City of Dire Dawa | Traffic Police | Director | | X |
| **Mahadi Mohammed** | City of Dire Dawa | Traffic Police | | | |
| **Michael Surafel** | Federal Road Authority | Dire Dawa branch | RN & MCM Director | X | X |
| **Sa'eda Awale** | Federal Transport Authority | | Director | X | |
| **Abebaw Sahilu** | Federal Transport Authority | Transport Office | | | |
| **M. Abdallah** | Kebele 2 Administration | Export affairs | Manager | | |

| | | | | | |
|---|---|---|---|---|---|
| **M. Said** | Kebele 2 Administration | Land development | Manager | | |
| **Dereje Bekele** | Dire Dawa University | | Researcher | | |
| **Tasfaer Nere** | Dry Freight Transport | | Representant | | |

Contributors to the SUMP of Dire Dawa

## 7.2. Timetable of the SUMP development

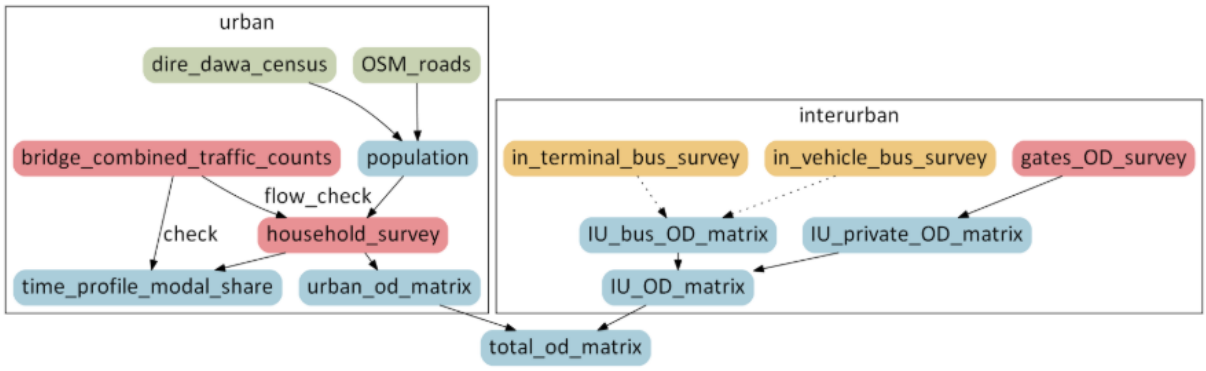



Timetable of the SUMP development

## 7.3. Data collection methods

The survey program encompasses qualitative and quantitative surveys:

- **Qualitative surveys** include interviews with mobility stakeholders and focus groups with representants of specific groups part of the civil society. Related activities are presented in chapters 2.3 and 7.4 of the present report;
- **Quantitative surveys** are meant to support the mobility diagnosis as well as the development of a demand model. The derived program is summarized on the figure below. The census, residential roads and satellite view are combined to consolidate the spatial estimation of the population. Based on this population, the sample of the household survey is designed. The bridge combined traffic counts is used as control data to check the time profile, the modal share and the overall volume of trips.




Schematic view of the quantitative survey program

| Demand surveys | Suppy surveys |
|---|---|
| ■ **Household Interview Survey** (HIS), to characterize the trips done by residents of the study areas in terms of mode, purpose, time, origin/destination (O/D) with regard to the household characteristics.<br>■ **Combined traffic counts**, to measure traffic volumes (in passengers and in vehicles) and daily variations on the main roads of the city, in cars, motorcycles, bajajs, buses and micro-buses. Theses counts measure both private and public transport demand. The combined traffic counts also enable to assess the public transport and paratransport capacity.<br>■ **Origin-destination** (OD) surveys, to characterize traffic flows coming in and out of the study area and to better understand the interurban Bajaj and private trips.<br>■ **Stated preference** (SP) surveys, to determine the sensitivity of the demand to the levels of service of different modes. It provides for example the value of time and the perception of the different modes | ■ **Preliminary transport survey**: it is qualitative survey that will be carried out by BJ consult during 1 week in each city in order to forge a strong survey oriented understanding of the transport system. It will help refine the other demand and supply surveys<br>■ **Formal and informal bus GPS tracking:** The bus routes are tracked with a GPS device in order to map the bus network and assess the commercial speed of the public transport.<br>■ **Bus stop Geo-Localization:** The bus stops will be geo-localized in order to build a structured public transport database (GTFS)<br>■ **Bajaj tracking :** Bajajs speed will be tracked in order to know better the speed on the main roads during peak hours |

Quantitative survey program

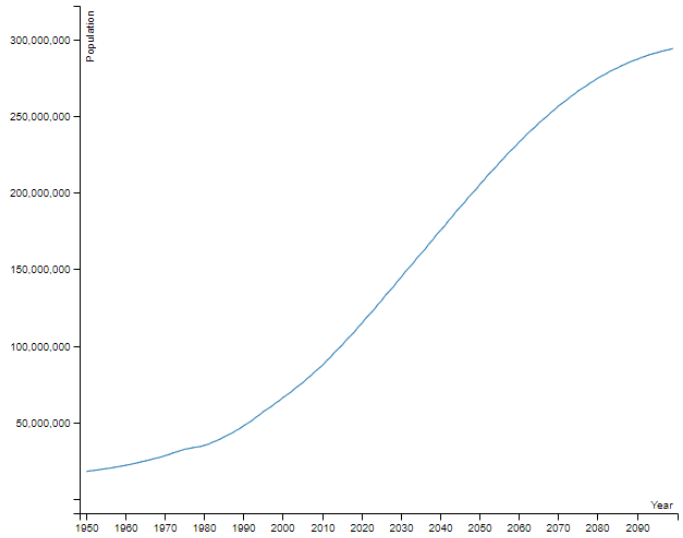
The following chapters further describe the rationale for the design of the quantitative surveys.

## 7.3.1. Local context

Three main issues that are faced regarding data collection: the lack of accurate census, not really structured road hierarchy and the lack of public transport information.

The last census was made in 2007 when the population of the country was approaching 80 million people. It has since grown by over 40%. In Dire Dawa region, it was less precise (143 pages, whereas

the census of the Southern Nations, Nationalities and People's Region (SNNPR) counts 1084 pages). A new census was planned for 2019 but it was cancelled. In addition, there is not much information about the localization of the households in OpenStreetMap. As a consequence, the weighting and sampling processes that are required by the household interview survey cannot be based only on the census. There is a need for another source of data in order to design the sample and weighting of the Household Interview Survey.




**Evolution of the ethiopian population**

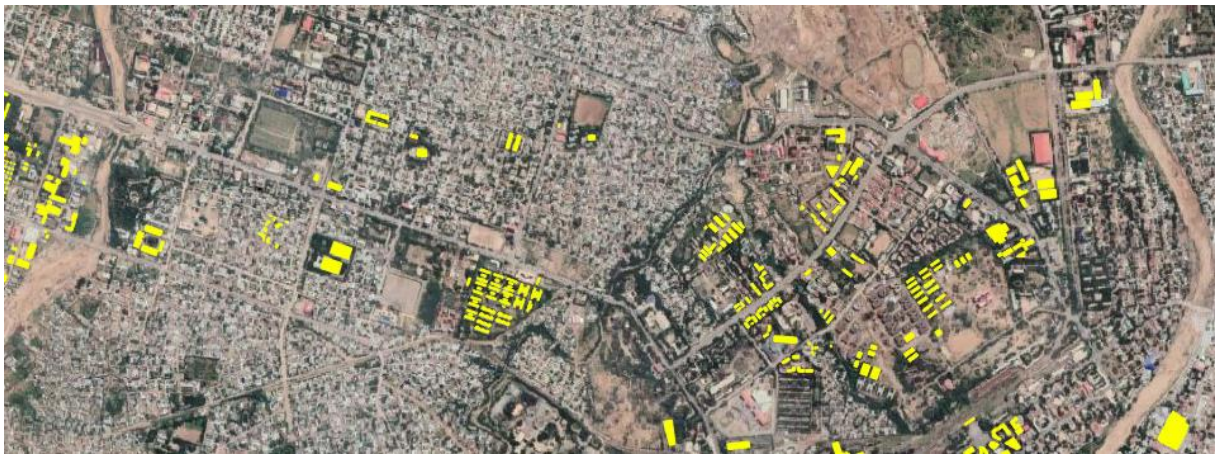
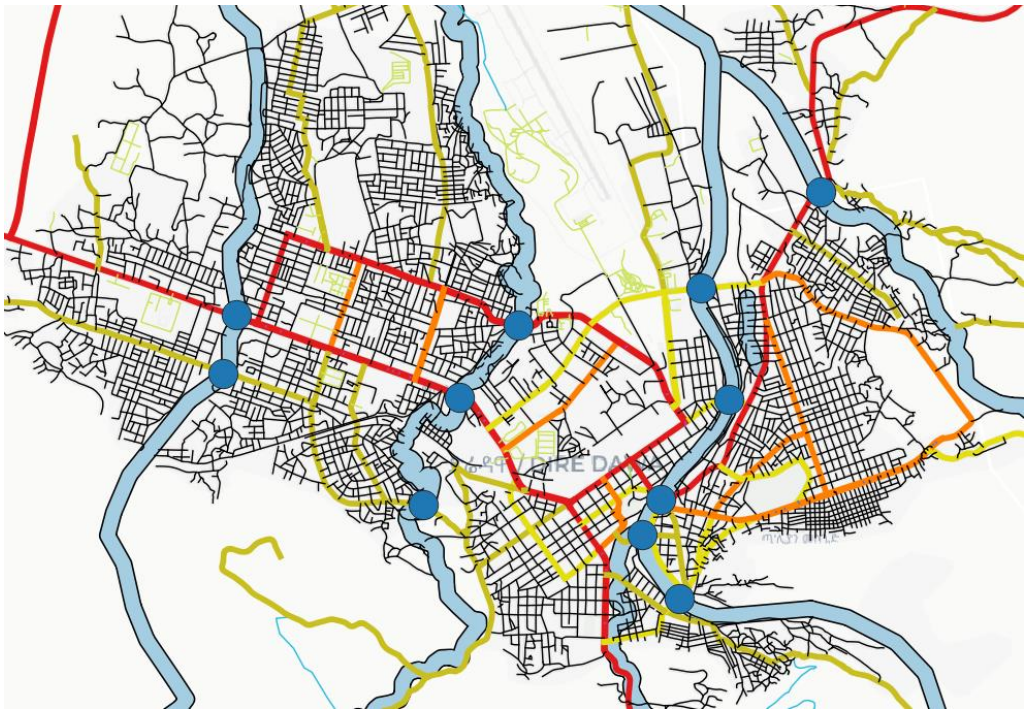


**Figure 1 Buildings in Dire-Dawa as documented on OpenStreetMap, the residential households are absent**

The informal minibuses and the bajajs are more developed than the formal bus companies. As a consequence, there is a strong need for a preliminary transport supply study. And the formal and informal public transport mapping will be a valuable database not only for this study.

Regarding traffic countings, whereas the local road fabric, and especially the high density of residential roads makes it difficult to build efficient screenlines, the rivers counterbalance this drawback. Indeed, the City of Dire Dawa is divided in 4 main zones which are connected by about 10 bridges. City wide trips can thus be surveyed at these bridges. It is convenient for the organization of efficient screenlines in the combined traffic counts.



**Main roads, rivers and localization of the road counts in Dire Dawa**

## 7.3.2. Household Interview Surveys (HIS)

Household Interview Surveys are the only way to get an exhaustive, in the sense that it covers the full territory of the study, and non-biased description of mobility on the perimeter of the study. It thus figures the main source of transport demand data of this study. The other surveys aim at complementing and checking the HIS.

Thanks to HIS, it is possible to:

- Build the spatial structure of the demand for all passenger modes, including for walking and cycling, that is necessary for modelling;
- Calculate aggregated indicators in a robust manner: pax-km and veh-km by mode of transport that will then be used to estimate CO2 emissions;
- Have information on household characteristics as well as people making trips that can later be used for traffic forecast taking due consideration of socio-economic evolutions such population, income and car ownership.

Designed according the CEREMA guidance[12], that stands as an internal standard, it encompasses the household socioeconomic profile, members characteristics, and trips of the previous day for all members above 6 years old. In addition, it features an opinion survey that aimed at providing qualitative information regarding mode perception and expectations about transport information.

[12] CEREMA is the French major public institution for developing and capitalizing on public expertise in the fields of planning, regional cohesion, and ecological and energy transition.

**Area of the HIS in Dire Dawa**

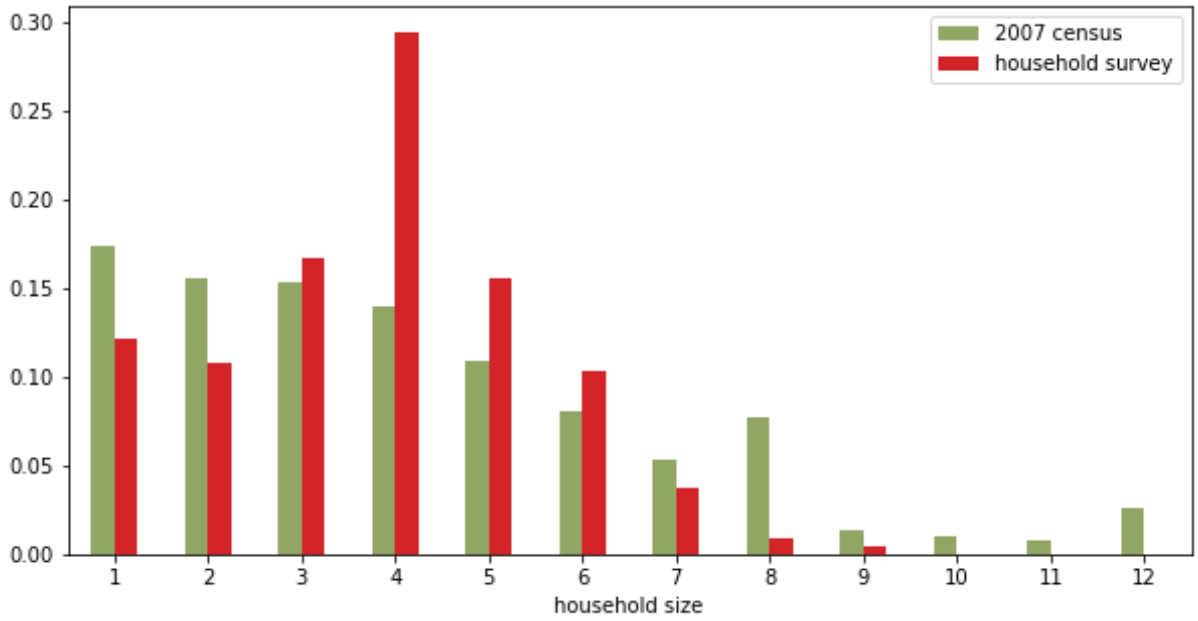
## Sampling method

The sampling size has been calculated according to 2007 urban population, projected to 2019. Statistical adjustments were performed according to the following considerations:

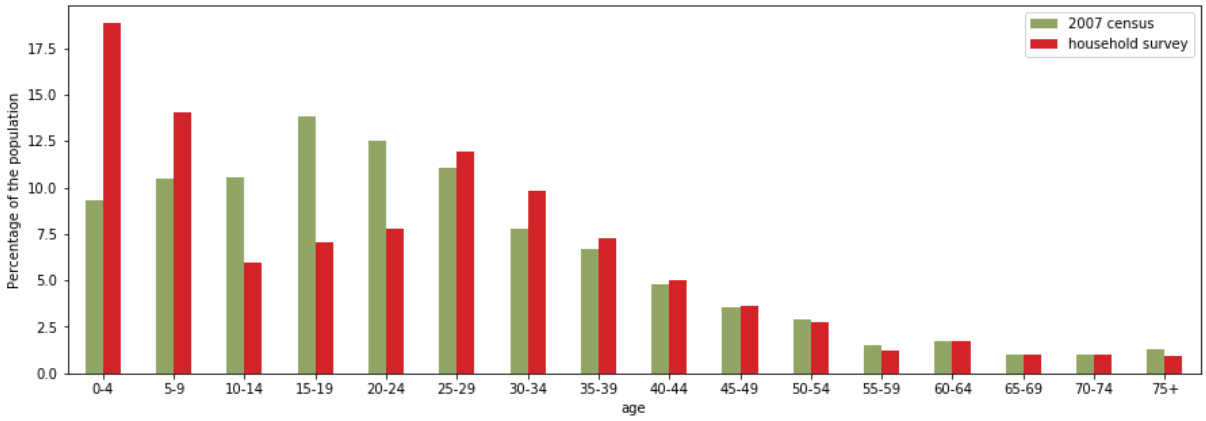
- At household level: no statistical adjustment, for the sample is fully representative of the household number per Kebele. Although a few large households were surveyed[13], in comparison with the census, adjustment was not relevant for the household structure is from the 2007 census and it is likely that the trend has been toward a reduction of household size ever since;
- At member or individual level: weight of individual record has been adjusted according to the age but not according to gender, in order to correct the natural distribution, still based on the 2007 census.

The resulting sample size is 75 000 urban households in 2019. Thus, 1 036 households were surveyed across the 9 urban kebeles, corresponding to a total 2 792 individuals.

[13] Household with more than 7 members




**Comparison of the distribution of households per size, in the household survey sample and in the 2007 census – source : SYSTRA, 2020**




**Comparison of the distribution of the population per age class, in the household survey sample and in the 2007 census – source : SYSTRA, 2020**

## Implementation protocole

As there was no existing database with household addresses that allowed for a random sampling, the following "random walk procedure" method was adopted:

- Sample quota assigned to each city district proportionally, according to share of city population;
- Randomly choose neighborhoods;
- Randomly choose starting point;
- Survey every 10th household
- In case not everyone is at home, the surveyor shall come back later to complete the questionnaire.

## 7.3.3. Stated preferences surveys

The stated preference survey have been aggregated to the household interview survey in order to avoid biases and to save resources, compared to an outdoor stated preference survey. The sensitivity

of demand to a change in supply (time, price, frequency) is measured in order to be able to test different scenarios of mobility development. This sensitivity of demand is conventionally measured with stated preference surveys in which individuals are faced with situations of choice (fictitious but close to their daily lives) between different possibilities of movement, for which they must select their favourite alternative.

### 7.3.4. Combined traffic counts

The main goal of the combined traffic count survey is to provide reliable control data for the household interview survey and for the demand forecast model. It has not been used as a primary data.

The combined traffic counts are designed to estimate the trip volume of all transport modes. Combined traffic counts provide results that are easy to process and less likely to be biased or incomplete, compared to separated car and bus counts. The counting points are organized as screenlines. In each location, the following information are collected:

- Cars and car occupation rates
- Bajajs and bajajs occupation rates
- Buses and occupation rates (if the relevant points)
- Motorcicles and bicycles.

The focus of this survey is the peak period, although  a few points are surveyed all day long.

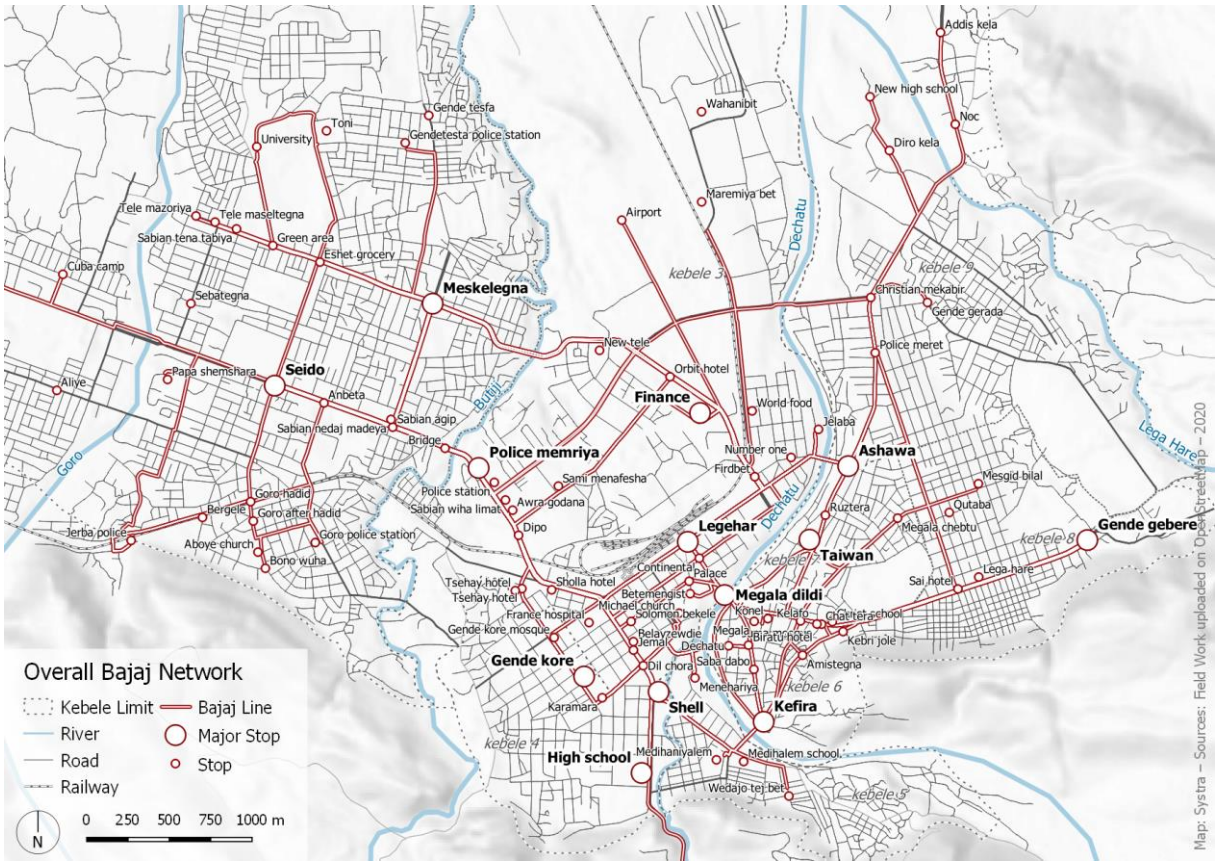
### 7.3.5. Transport supply survey

As previsouly mentionned, there was no public transport data available describing the actual routes and level of service. Consequently, it was necessary to carry out transport supply surveys in order to be able to refine the design of the demand surveys, have it as an input of the traffic model and provide a consolidated vision of the current transport network, as an output of the diagnosis.

The transport supply surveys would be the following:

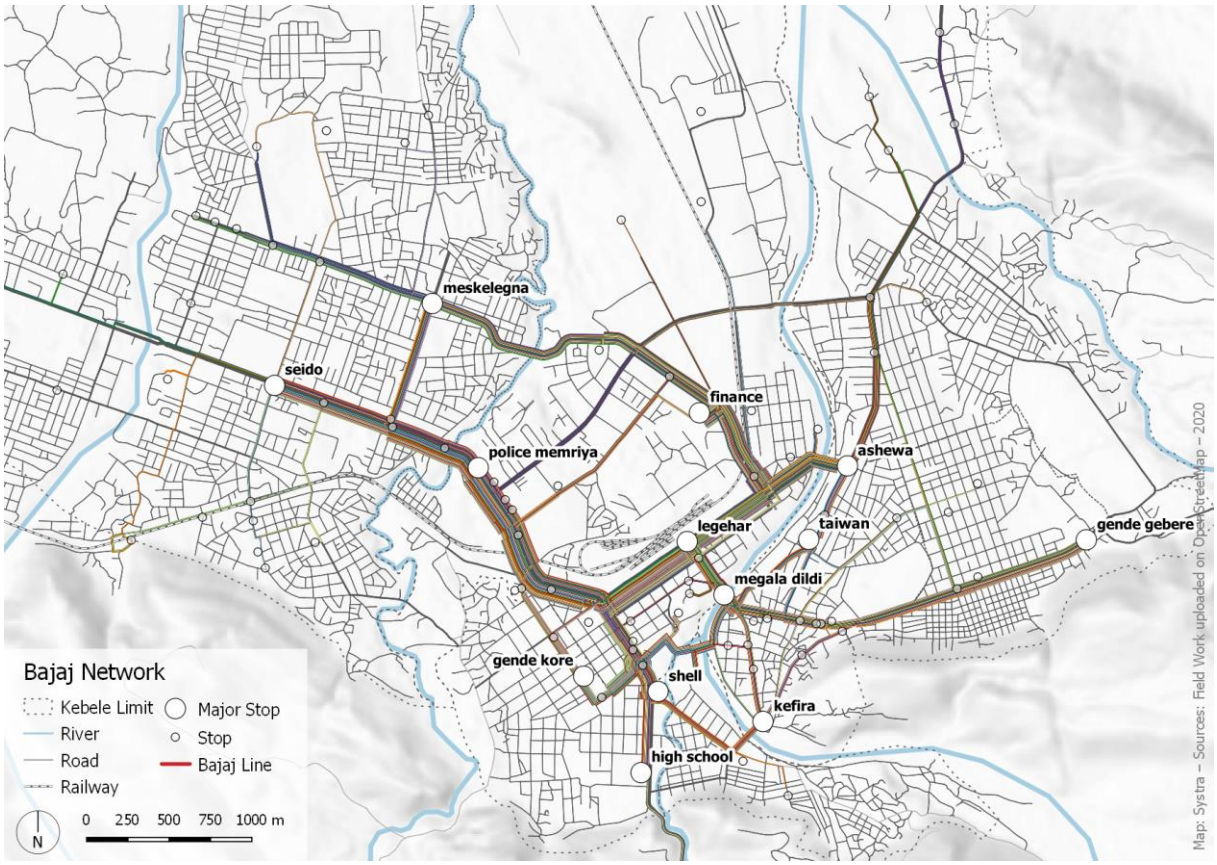
- A preliminary qualitative transport survey to
- GPS tracking of the buses and the bus stop
- In terminal Bus surveys
- GPS tracking of the bajajs

This preliminary transport survey is conducted to localize Bajaj hubs and identify the Bajaj routes in each hub.




### Bajaj hubs

GPS traces of Bajaj lines has been hung up on the road network in order to reconstruct a map of the network, serving both modelling and analysis purposes. This process is based on an algorithm developed by SYSTRA and inspired by (Poletti, 2016). In addition to itinerary tracking, the survey app allows for Bajaj stop geo-location. All the applicative tools that have been used are developed by SYSTRA in Python language, under an open-source license (Syspy module).




Bajaj lines network

## 7.4. Participation summary

### 7.4.1. Focus Group #1 - micro economy representatives

The main points that can be underlined are as follow:

- Well-off shopkeepers do not live in the commercial district and come in the morning and leave at night, with sometimes some difficulties to move around through the congestion during the day. They mostly take Bajaj.
- Roads and pavement are much solicited by different activities thus generating congestion. deliveries are given on the pavement or the road (which can be fined by police), sellers settle on the pavement to keep close to clients, Bajaj drive and park wherever they feel necessary, etc.
- Some formal sellers even consider their shops as storage and sell along informal sellers on the pavement to be able to compete
- Deliveries are carried out by horse drawn carts (e.g. vegetables from Kefira market), Bajaj or small trucks (Suzuki). According to goods, they are locally (Harage) or globally sourced (through Addis and Djibouti).
- The attractivity of the commercial area can be limited by the effects of congestions as clients can have difficulties for access as well as for taking goods

### 7.4.2. Focus Group #2 - main economic activities

The main points that can be underlined are as follow:

- Walking is an important mode for workers to get to work (e.g. 80% of workers of the workers of the cement factories located to the west of the city).
- As workers living far from their plan cannot take Bajaj for cost and reliability reasons, factories organize their own bus services to drive them. Services are organized according to shifts in the factory. Travel time can be long, as services are limited and extended. Their reliability can be hampered by congestion. However, factories consider the organization of such services as a must for their operational reliability. They would consider however that a mutualization of these different services could notionally be a backbone for a transport public service.
- Factories have their own buses or rely also on subcontracting to provide transportation service to their personnel. They also have smaller services for middle management (minibuses) et provide cars for top management.
- Along with the main factories, administrations and schools also organize their own services. In that perspective, a factory manager even considered the City Bus service as a City Hall service for its employees rather than a public service.
- Regarding the transport of goods, truck transport is the main mode, with different levels of relations ranging from local level to national ones to Addis or international ones to Djibouti and Somaliland. Demand is higher than supply which draws prices up.
- Factories tend to rely on contractors for inbound/outbound logistic: companies may afford it if inputs are collected regionally. Transport of imported inputs (from abroad) is more likely outsourced, and customer are left in charge of the delivery of their products.
- However, transport suppliers (by truck) are not fully reliable, for the supply not always meet the demand and care first for public command. Drivers' behavior is also an issue.
- Train supply is tested for some goods (cement) though marginally, as shift from road to rail and rail to road are needed at both ends. It is not seen much more competitive, due to the induced loading/unloading operations.

### 7.4.3. Focus Group #3 - Bajaj users

The main points that can be underlined are as follow:

- Bajaj supply seems abundant in the city but is in fact not so well distributed according to time (evening, night, weekends…) and space (some districts out of the center a main axis)
- It is also a rather segregated supply on economic terms: line based operated Bajaj are affordable for most passengers, but contract Bajaj are not, with a cost difference from 5 to 10-fold between the two. Contract Bajaj are like taxis taking their passengers from A to B. Line Bajaj are line based, involving some transfers to make a full trip, which is longer and less predictable. Regarding rolling stock, three passenger Bajaj are used for both line or contract based rides while five passenger ones (Force) are rather dedicated to line based rides.
- Bajaj drivers prefer to operate as much as possible on contract basis, skipping for instance the compulsory line operation hours (peak hours), while demand for line operated Bajaj is high. Tension on the market is palatable as line Bajaj supply is somehow beyond demand.
- Users take line Bajaj on week time for work purposes but have no other choice at weekends to rely on contract ones, thus limiting their trips for cost reasons

- Bajaj users complain about volatile fare levels: drivers set their own prices without regulations and never miss an occasion to drive them up when demand is higher than supply (evening time, festival time, etc.)
- Bajaj users rather would like an improvement of Bajaj supply through better supply and more regulated fares rather than a switch to other modes (e.g., bus), which is not seen like an attractive alternative (may be safer on long distance but also takes more time, due to boarding/alighting in stations).

### 7.4.4. Focus Group #4 - Non-Motorized Modes

- Participants approve the main findings of the diagnosis regarding walking conditions in the city, especially regarding the uneven presence or quality of the sidewalk, as well as the fact that some master urban blocks hamper mobility.
- Walking stands as the most obvious alternative to Bajaj and is then preferred in circumstances when Bajaj are not a valid option: at night, but also at the end of the month, thus highlighting the economic weight of Bajaj contract.
- Main challenging factors for walking are the climate, the lack of proper infrastructure and the traffic. Physical effort may be dissuasive for people not accustomed to walk, although the restrictions enforced during the pandemic may have change this perception.
- Three main levers are quoted by participants to improve walking conditions: limit dedicated space to Bajaj, improve and maintain the sidewalks, and care for obstacles formed by gutter and drainage systems, that also happen to be inefficient in rainy days. Overall, a better maintenance stands as a major area for improvement.
- As for micro interventions, the participants pinpointed various relevant spot: Seido, by the bus station (busy place with intense commercial activity), Meskelegna (sidewalks occupied by sellers), Khat market/Lega Hare (crowdy place that get dodgy between 12 and 2 due to Khat consuming), High school by Harar road (street is narrow and a goat market takes place at the entrance of the school)
- Regarding macro interventions, the proposal of a promenade along the Deshatu river seems an interesting idea although some cleaning work would be required. Besides, the participants noted that the heart of the city was now in Sabian. The rehabilitation of the old railway into a walking infrastructure does not convince all attendees, as it still stands as a local landmark some people are sensitive to.
- The concept of a walkers association is welcome by participants, who mentioned that walking in company was a positive incentive. Although the way to connect walkers together doesn't seem very clear to attendees, a walkers association would be useful to organize walks for leisure and report accidents or abusive occupation of sidewalks to the City Administration.

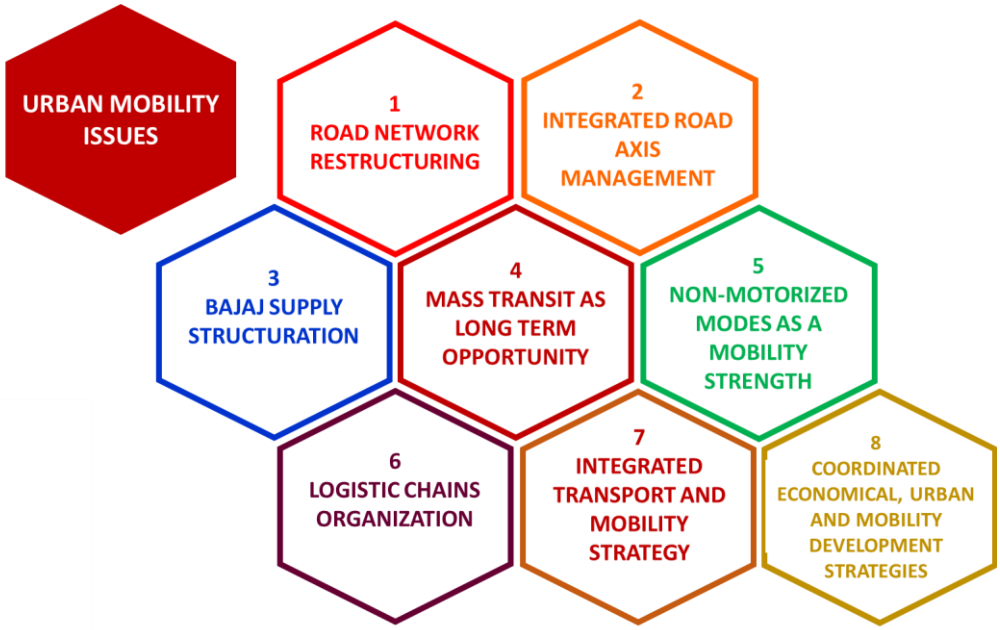
### 7.4.5. Focus Group #5 - Urban layout and design for marketplaces in dense urban area

- Participants approve the main findings of the diagnosis regarding the impacts of congestion and conflictive uses, that overall create an unsecure environment for both sellers (steal of goods) and customers (improper use of public space), thus downgrading the attractivity of marketplaces.

- Concepts of action were well received and considered interesting by participants: regulate freight and pax flows (with possible times reserved for freight and residential access and others reserved for customers' access), turn the area pedestrian, limiting the traffic to the minimum (from one line of bajaj to no bajaj at all), open new marketplaces, thus creating attractive public spaces.
- Regarding the latter, shop keepers indicated that most of them were renting their premise and would then be eager to move to another marketplace if seen more attractive.

### 7.4.6. Technical workshop #1 – Diagnosis main findings and mobility issues

Workshop #1 consisted in a presentation of the key outcomes of the diagnosis, followed by a discussion about the main mobility issues identified (see below). Comments from the participants are detailed hereafter.




The different issues raised from the diagnosis have been discussed and the following points have been raised.

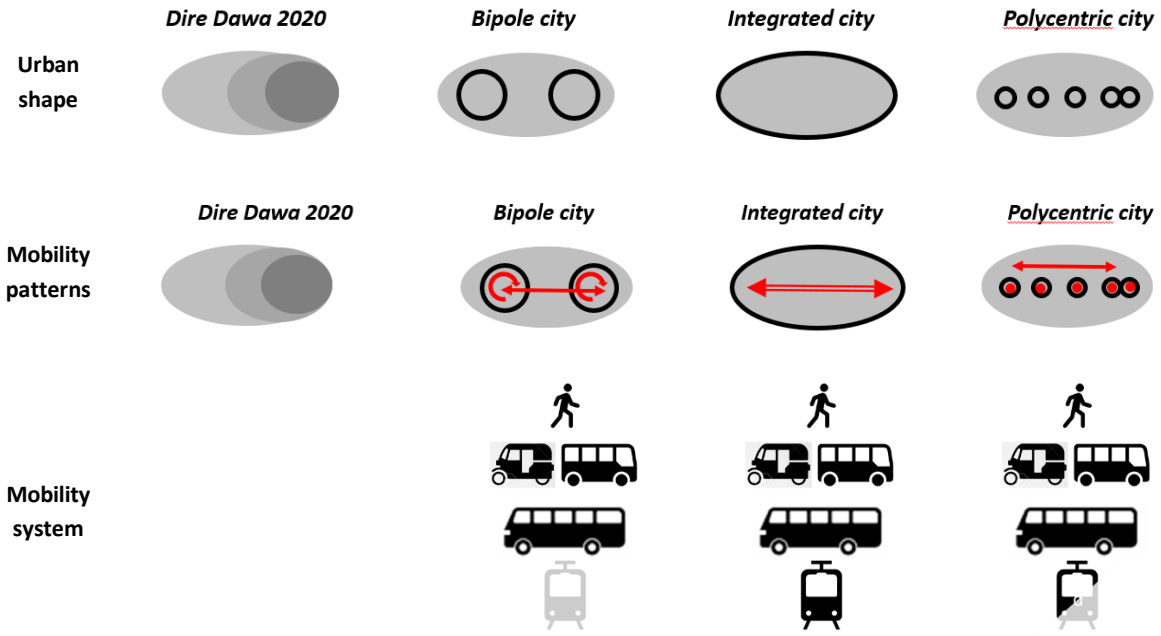
- Issue 1: road network structuring. Road design is not always well adapted to road uses. In particular, city asphalt roads are not suited to heavy interurban traffic (gravel road would)
- Issue 2: integrated road axis management.
  - Appropriate parking -especially for Bajaj- around feeder roads giving in the main road is necessary to prevent congestion
  - Drainage system is not necessarily fit with hydrological needs and types of road. A hydrological appraisal would be needed with accurate data.
  - Separated walkways are not systematically present on the main roads. They can be discontinuous or abusively occupied. A more consistent grid would be needed.
  - Open markets along the roads hinder pedestrian walkways and push pedestrian on the road itself.

- Roadside ditches are sometimes not properly covered and can be an impediment to walking and even a threat to pedestrian safety. That makes local road more suitable for walking than the main ones. In order to access to their plot, some residents may fill the ditches with soil, which alters their hydrological purpose.
- Overall, a proper articulation between main roads and local roads is an issue (they can sometimes be even separated by a ditch). Road design should be harmonized to integrate these aspects.

- Issue 3: Bajaj supply structuration. Bajaj drivers can randomly change fares according to traffic disruptions and to location, especially in peripheral areas. As a consequence, suburban population are very badly served, for they suffer the burden of distance and scarcity and are vulnerable to Bajaj drivers whims.
- Issue 4: Mass transit as a long term opportunity. Mass transit would be relevant on the main East West road serving all the city of Dire Dawa. On a user perspective, it would be more economical. More generally, it would reduce congestion and related externalities (safety, etc.)
- Issue 5: Non-motorized modes as a mobility strength. People awareness for the proper use of walkways is variable. It is noted that urban newcomers from the rural areas can be used to walk on the road rather than on sidewalks.
- Issue 6: Logistic chains organization
  - Trucks transit generates users conflicts, typically between trucks and Bajaj.
  - Facilities for heavy trucks are located in the city center (hotel, restaurant, garage, spare parts), some being concentrated in specific places like gas stations. None can be founded at the outskirts currently, but projects are contemplated to create proper service centers on the main transit road out of the city.
  - A pilot project was carried out to concentrate trucks to the outskirts out of the urban area (Harar road, near the national cement factory) but it proved unsuccessful as it was not serviced nor guarded.
  - The exclusion of trucks outside the city during peak hours has also been tested (6 am - 8 am, 11 am at 12.30 pm).
- Issue 8: Coordinated economical, urban and mobility development strategies. Urban extension is not matched adequately by infrastructures and transport service developments.

### 7.4.7. Technical workshop #2 – Stategical vision and objectives

Workshop #2 started by a recap of the feedback collected through the previous workshop. Participants were then invited to discuss about the foreseen and desirable future for Dire Dawa mobility, based on the city shape after the implementation of the New Industrial Park. Considering different potential urban forms, incidence on mobility patterns and mobility system were commented.




Results of discussions with the participants are detailed hereafter.

## City organisation and mobility prospects

- The Integrated city seems to be a possible long-term (even very long term) perspective for the city. Considering the size of the New Industrial Park and its economic weight (250 000 expected jobs) it will have a city-wide influence and draw workers from the whole city and beyond, from rural areas. From that economic angle, integrated city is a prospect. However, a significative part of workers could be accommodated near the industries, thus creating a pole of its own. According to the focus group organized with local industry managers in March 2020, about three fourth of workers live close to the factory while the remaining share lives further away and is driven to the factory by dedicated transport services. In addition, the type of jobs offered by the New Industrial Park will require profiles likely to come from rural Kebeles rather than urban Kebeles. These aspects make the option of a bipole city a potential prospect.
- A polycentric city is also a potential prospect for city development. The urban structure of the city is shaped by natural barriers - rives, mountains – which has generated different subcentres. This polycentric urban shape is consistent with the Structural Plan currently in preparation as it develops a polycentric vision of the growth of the city for the next 10 years . In fact, it aims at reinforcing/creating urban centres distributed in the extended urban area, along the East-West axis, thus contribution to a potential “linear city”. It would encompass new settlements extending from Djibouti Highway to the East to the New Industrial Park to the west. Besides, polycentric structure is considered mobility wise as it brings services closer to the people and reduces the length for many common trips.
- On institutional grounds, actions on infrastructure and transport are share between three different decision makers that do not necessarily work together (Federal Transport Authority, Ethiopian Road Authority, City Road Department). Therefore, no proper coordination exists in planning between different scales or levels (federal/local). There is often no match between investment and maintenance nor integrated mobility management.

### Potential Threats

- Parts of the city, e.g. Goro or Gende Tesfa, are currently not easily accessible given their peripheral location. Contiguity to existing urban fabric is not enough for a settlement to be properly integrated to the core city as transport infrastructures as well as mobility services are also needed. This can result in social marginalisation or even exclusion of the population living there. Conversely, development of new road infrastructures is not enough to create urban fabric. A strong articulation is then needed both at planning and implementing stage to address these threats.
- Economic development and urban planning are currently carried out with little consideration to transport planning, that is thus considered as an adjustment factor, coming low and late once key decisions have been taken.

### Possible actions for the short term

- Road restructuration in relation with functions, thus moving toward a meaningful road hierarchy,
- Road management, especially using new technologies
- More trucks regulation, including to divert truck flows from the city centre
- Identifying accident hot spots to implement measures allowing to reduce them
- Implementing surveillance system on spotted intersections
- Creating alternative economic opportunities for Bajaj drivers to limit dependence on the sector,
- Consider bajaj service restructuring in a wider transition: line restructuring according to needs, bajaj as feeders to a future MRT backbone
- More space should be dedicated to NMT and considered prior to utilities provision. Indeed, roadsides should not to be considered only as dedicated land for utility providers.

## 7.4.8. Technical workshop #3 – Development scenarios

The development parameters and the three mobility scenarios were presented step by step and discussed with the participants. The following point have especially been raised.

### Target level of population in 2040

Discussions were held on the following inputs to define the estimated population level of Greater Dire Dawa in 2040:

- **Urban area extension**: it was underlined that it was important to take into account the neighbouring rural kebeles or part of them that are to be included in the urban area. According rural population should be added to the urban population already taken into account.
- **Floating population**: all inhabitants of Dire Dawa are not registered inhabitants and il should be checked that unregistered inhabitants are duly taken into account. The consultant underlines that a level of floating population is already taken into account. A check with CSA figures will be done.
- **Urban growth**: a 4% annual urban growth rate has been defined on the basis of the average growth on the last twenty years. This value comes as an average on the range of values proposed in other studies.

- **share between internal growth and migration related growth**. The city grows from both. The SUMP has taken into account existing inputs but has not carried out demographic studies on this aspect.

## SUMP perimeter

Discussions were held on the SUMP perimeter. It was underlined that it is a functional area encompasses all present and potential urbanised areas, including the new industrial park.

This perimeter is used for modelling and action plan.

The SUMP is thus an urban perimeter that is distinct from the regional perimeter of the Dire Dawa region. The latter is much more extended and includes wide rural areas, to be structured with upgraded rural centres (rural cities).

## Relation between city extension, population density and mobility efficiency

The key relation between these three aspects has been well discussed within the group to analyse and compare the different scenarios.

It was discussed if a particular level of density was to be attained to reach mobility efficiency. No such fixed level does exist but the right levels of density in landuse targets should be considered along city extension considering transport efficiency. Considering the existing ability of Dire Dawa to be dense city, this should be considered as an asset for the city.

## Inclusion of informal settlements

A discussion was held on informal developments. These informal urban developments are included in the city footprint proposed in the scenarios. Informal developments represent a very significant part of urban development. They cannot be forbidden as the address a much needed social demand.

However, it is possible to orient and focus informal development in order not to miss the target of a compact city. For instance, some areas should probably be strictly forbidden for such development, with adequate enforcing measures while some others should be left opened, in a significant manner, in order to address demand and to open a way for future formalisation (bringing urban facilities later on and formalising land tenure).

## Economic development of the city

The different scenarios assume that the economic development of the city will be significant. Modelling takes into account existing and future job numbers.

However, the SUMP rather considers the location of economic activities according to their types (plants, shops, etc.) rather than their precise content. This topic is rather considered through input studies and stakeholders insight as necessary.

## Smart city concept

Mobility proposals for the SUMP include smart mobility aspects. These will be developed later on through the SUMP proposals and discussions with stakeholders. For instance, smart information related to transport services, electric transport services in the new industrial park taking advantage of the electricity supply of the plans can be considered.

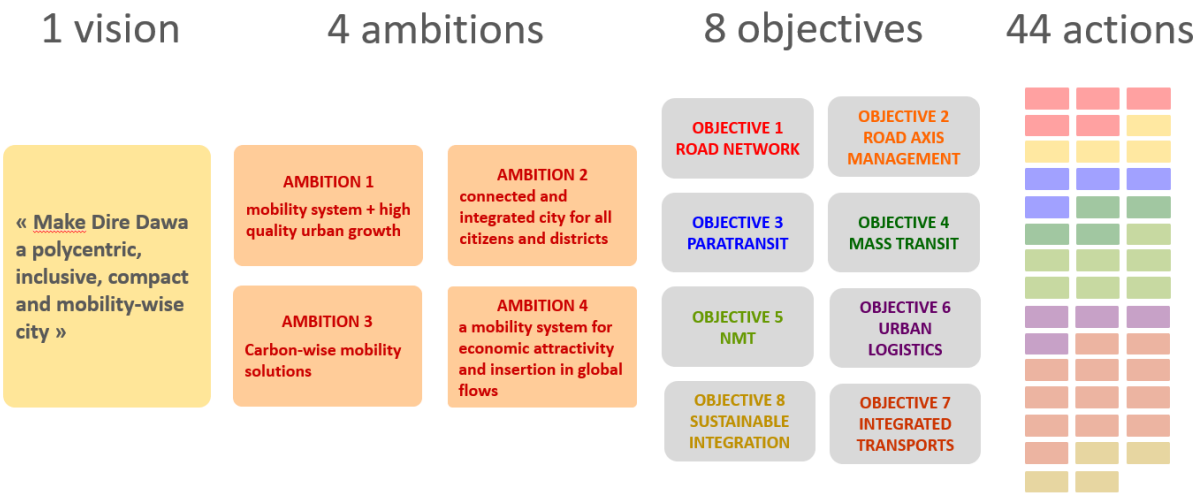
## Conclusions

In conclusion, the following points were underlined:

- The scenarios propose some interesting prospects for the future of Dire Dawa, all possible, if not all desirable,
- The target vision can be grounded on the polycentric scenario but can take focused aspects that would be relevant in other scenarios,
- The demographic basis of the scenarios should be checked according to discussions and input documents,
- Some scenario names could be discussed

## 7.4.9. Technical workshop #4 – Objectives and action plan framework

Workshop #4 started with a presentation of the target scenario evaluation, the ambitions and objectives, as well as the action plan framework.



| ACTION PLAN MATRIX | TYPE A OPERATIONAL PROJECTS | TYPE B PROCESS & GUIDELINES | TYPE C POLICIES & STRATEGIES | TYPE D GOVERNANCE & FINANCE | TYPE E INTELLIGENCE & CAPACITIES | TYPE F AWARENESS & EMPOWERMENT |
|---|---|---|---|---|---|---|
| OBJECTIVE 1 ROAD NETWORK | Main / micro road projects | | | | | |
| OBJECTIVE 2 ROAD AXIS MANAGEMENT | Roads upgrade projects | | | | | |
| OBJECTIVE 3 PARATRANSIT | Parantransit structuration | | | | Capacity reinforcment | |
| OBJECTIVE 4 MASS TRANSIT | Bus network / BRT dev. | | Mass transit dev. plan | | | |
| OBJECTIVE 5 NMT | | | | | | Cycling in Dire Dawa |
| OBJECTIVE 6 URBAN LOGISTICS | | | Urban logistics dev. plan | | | |
| OBJECTIVE 7 INTEGRATED TRANSPORTS | | | | Integrated transport auth. | Mobility projects mgt. | |
| OBJECTIVE 8 SUSTAINABLE INTEGRATION | | TOD handbook | | | | |

Participants highlighted the followings:

- Regarding institutional settings and especially the creation of an integrated transport authority, practical examples or best practices would be welcome, either from developing or developed countries. Generally, case studies will be featured on the action plan to illustrate particular concepts of action, based on concrete examples;
- Regarding modal share, the relatively low share of walking in the target scenario, as compared to other cities was outlined. As mentioned above, the presented scenario modal share is actually an estimation of foreseen patterns, based on current transport behaviours and anticipated urban developments. It is not to be considered as a target but rather a baseline that could be improved, depending on mobility policies that will be adopted, especially regarding the promotion and incentive on NMT. Besides, it shall be noted that due to the magnitude of foreseen developments, such modelling results should be considered with caution. Indeed, the predictive power of a model lowers as the initial situation is fundamentally disrupted;
- Consistency between road development scheme from the SUMP and the ongoing Structural Plan was put into question. It was then reminded that the SUMP proposal consists in a selection from the same work carried out by the Project Office. It includes the roads that best fit the shape and needs of the city;
- Awareness raising not only concerns the citizens but also the administrations, as gaps might be observed, due to frequent turn-over within institutions. This point is well understood and partly handled through the E-actions, “Intelligence and capacities”. Besides, it is assumed that administrations awareness will build-up along the implementation of projects, processes and policies;
- Inclusive mobility awareness should not be only gender-based but also disabled-based. The same line is considered by the Systra team that rather considers “universal access” than gender issues.

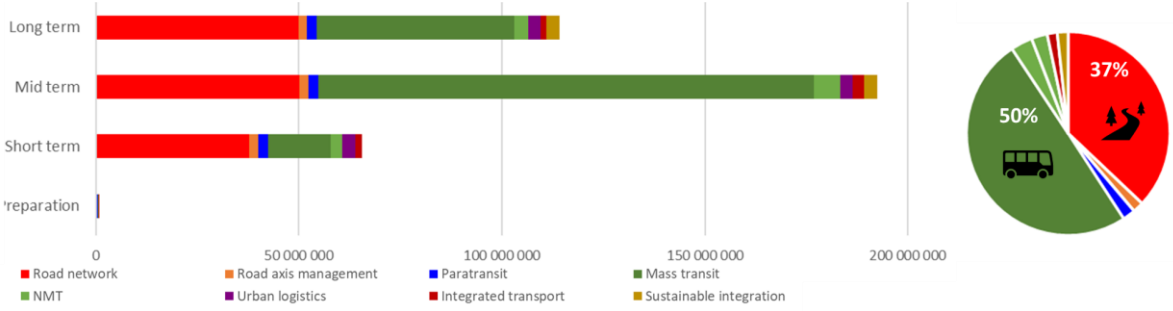
## 7.4.10.Technical workshop #5 – Priorities, schedule and financing

The Technical workshop has been the occasion to discuss and validate the key implementation aspects of the SUMP regarding the following aspects:

- overall schedule with a preparation phase of two years followed by three five-year programs
- overall SUMP budget and according foreseen financial resources
- SUMP governance scheme.

| | Preparation 2023-2024 | Short-term program 2025-2029 | Mid-term program 2030-2034 | Long-term program 2035-2039 |
|---|---|---|---|---|
| GENERAL | Getting organized and prepared<br>setting up teams, processes and operational targets. | Kick start sustainable mobility projects in the current urban area of Dire Dawa | Support the extension of the city and the development of the New Industrial park (NIP) | Provide a wide array of sustainable mobility solutions in a new scale fully polycentric city |
| ROAD NETWORK AXES MANAGEMENT | Target Road and Crossroad network<br>Road maintenance plan<br>Circulation Plan | Focus on the city centre<br>Missing links<br>Densification | Relations with the NIP + Djibouti road<br>Densification, micro projects | Relations with the NIP<br>Toll Plaza + Eastern bypass<br>Densification, micro projects |
| PARATRANSIT AND MASS TRANSIT | Paratransit Transition Plan to define roadmap of actions and implementing conditions | Paratransit restructuration<br>Initial focused bus development | Paratransit restructuration<br>Bus Development<br>BRT Line 1 | Mass transit backbone<br>BRT line 1, line 2, line 3<br>Bus lines stemming from BRT |
| NON MOTORISED TRANSPORTS | Kick off of capacity building + awareness raising actions on NMT (walking and cycling) | NMT in road projects<br>Pilot micro urban logistic project in Megala and Kefira | Iconic NMT and city upgrade project (railway line, Dechatu banks) | Full NMT network<br>Second iconic NMT project |
| INTERMODAL RELATIONS | Multimodal strategy to care for the main interfaces between transports modes | Pilot hubs<br>Capacity building for SUMP implementation | Mass transit hubs<br>Mature SUMP management | Full transit hubs network<br>Fully mature SUMP management |
| TRANSIT ORIENTED DEVELOPMENT | Not started | Not started | TOD focus areas<br>TOD guidelines<br>TOD development plan | Growing number and value of TOD projects |

| OBJECTIVE | Preparation 2023-2024 | Short term 2025-2029 | Mid term 2030-2034 | Long term 2035 - 2039 | TOTAL | |
|---|---|---|---|---|---|---|
| Road network | 232 475 | 37 884 967 | 50 244 967 | 49 864 967 | 138 227 375 | **37%** |
| Road axis management | 159 136 | 2 094 934 | 2 094 934 | 2 094 934 | 6 443 937 | **2%** |
| Paratransit | 157 475 | 2 468 272 | 2 464 950 | 2 464 950 | 7 555 648 | **2%** |
| Mass transit | - | 15 409 776 | 121 971 662 | 48 570 681 | 185 952 119 | **50%** |
| NMT | 150 000 | 2 796 297 | 6 512 328 | 3 485 728 | 12 944 353 | **3%** |
| Urban logistics | - | 3 308 306 | 3 083 306 | 3 083 306 | 9 474 917 | **3%** |
| Integrated transport | 88 289 | 1 571 989 | 2 859 489 | 1 421 989 | 5 941 757 | **2%** |
| Sustainable integration | - | - | 3 310 797 | 3 161 628 | 6 472 425 | **2%** |
| TOTAL | **787 375** | **65 534 541** | **192 542 433** | **114 148 182** | **373 012 531** | 100% |
| | **0,2%** | **17,6%** | **51,6%** | **30,6%** | 100,0% | |







## 7.5. Description of scenarios

## 7.6. Traffic model report

### 7.6.1. Model fundamentals & structure

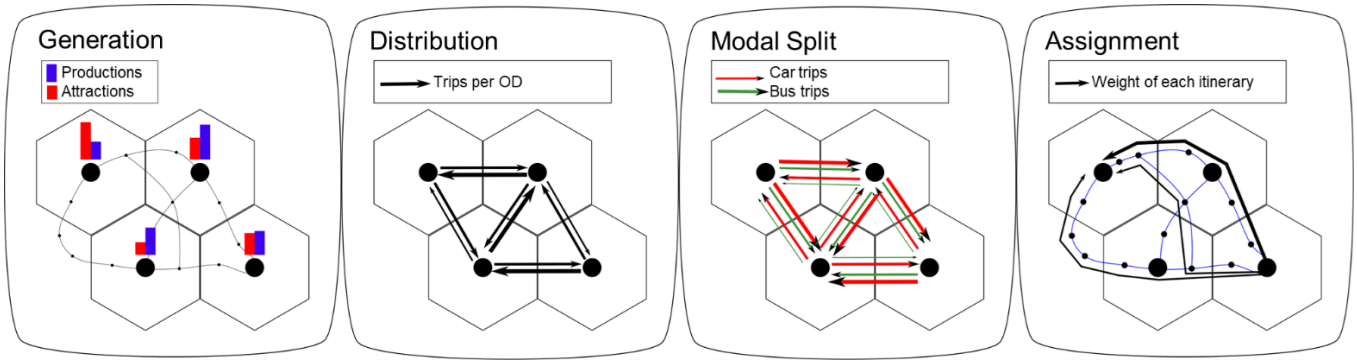
#### Brief presentation of the four-steps model

The 4-steps model breaks down the interaction between travellers (demand) and the transport system into 4 phases.

- Generation: in each zone of the modelled area, how many trips will be initiated and how many will be terminated.
- Distribution: what are the flows between pairs of zones.
- The choice of transport mode
- The choice of itinerary (assignment).

The first step is based on socio-economic parameters, the last three steps try to reproduce human behaviour: where people are going to go? By car or by bus? Which line?

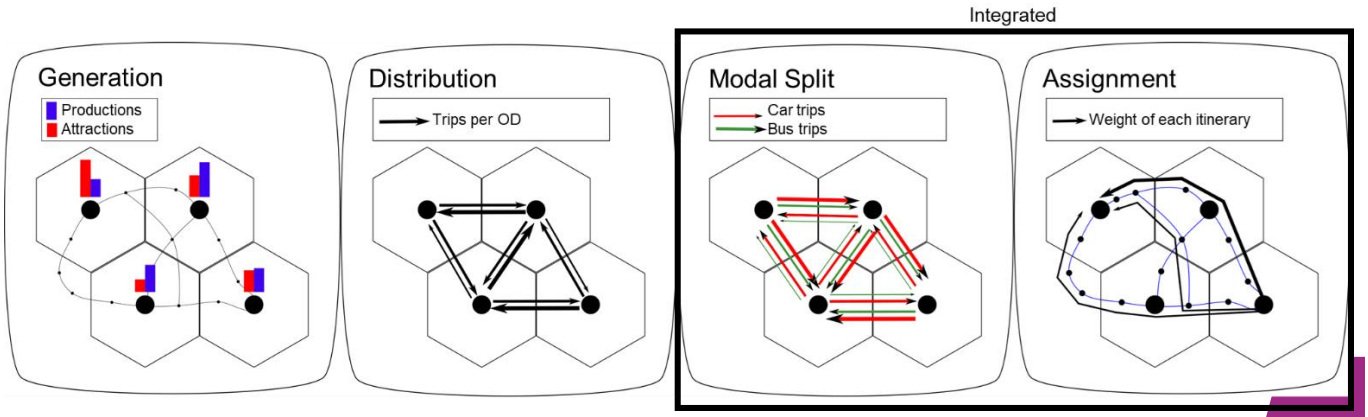
For each individual decision, the 4-stage model responds with an algorithm to reproduce the behaviour of all travellers.




Classical structure of the 4-steps model

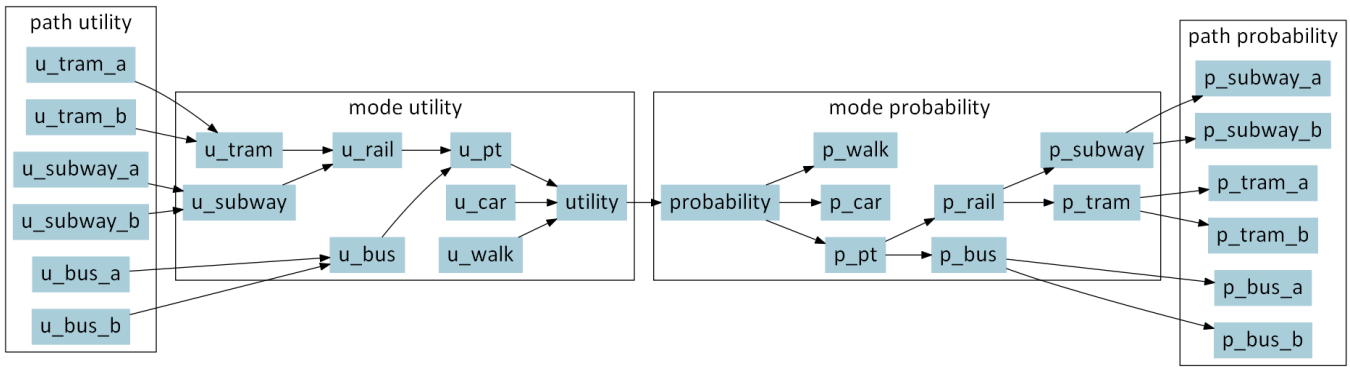
#### Dire-Dawa model structure

Dire-Dawa model is based on 4-steps model theory with minor changes



**Structure of Dire-Dawa model**

- The **generation** step is very simple: it uses the volumes found in the household survey and population growth projections.
- The **distribution** step is based on the data from the generation stage and uses a doubly constrained gravity algorithm (it respects boundary conditions: generation and attraction by zone).
- There is an enumeration step for public transport routes:
- The path enumeration stage in public transport is done through an algorithm called "optimal strategies", which considers the randomness of the arrival of vehicles at a stop and from that calculates a *transit strategy* to reach a final destination.
- The enumeration of car routes is an "all or nothing" enumeration as the input data does not allow for a very precise capacity constrained traffic assignment.
- The **mode choice** and **assignment** steps are merged into a single individual utility maximisation step. This stage uses a multinomial nested logit model. It results in a probabilistic allocation.




**Integration of modal choice and assignment steps in Dire-Dawa model**

## 7.6.2. Modelling tool: quetzal

Quetzal is a Python library for transport modelling. It was designed by Systra, it is an opensource library: free to use and free of charge.

The documentation is available here: https://systragroup.github.io/quetzal

The sources can be downloaded here: https://github.com/systragroup/quetzal

The model uses the Quetzal methods to reproduce the stages described in the previous part. The model is a folder with input data, parameters, and an organisation of Python scripts.

To evaluate a scenario the procedure is as follows:

- We define the parameters in an Excel file.
- Gather the input data in a dedicated folder.
- We define the structure of the model in notebooks (scripts) based on the algorithms written in Quetzal.
- To run model, we run the main script.
- Indicators and maps are generated automatically
- The output data is exported to a dedicated folder.

### 7.6.3. Calibration

#### Generation

At this stage, the number of trips of any mode produced and attracted by each zone are modelled. Usually, the productions and attractions are explained by social and economic variables. The linear combination is the most common formula:

$$Productions_i = \sum_j \alpha_j \cdot X_{ij}$$

$$Productions_i = \alpha \cdot Population_i + \beta \cdot Jobs_i$$

The impact of the accessibility of a zone on its trip generation is called induction. It is hard to quantify and most of the time, we assume that the accessibility of a zone does not impact its productions or attractions.

The data for the calibration are geo-referenced socio-economic information (to perform the linear regressions) and the productions and attractions from the household survey.

Sometimes, the data is not statistically significant at the detailed zoning level. When the productions and attractions are not significant at a low level, we work with an aggregated zoning (where each zone contains at least 70 households for instance).

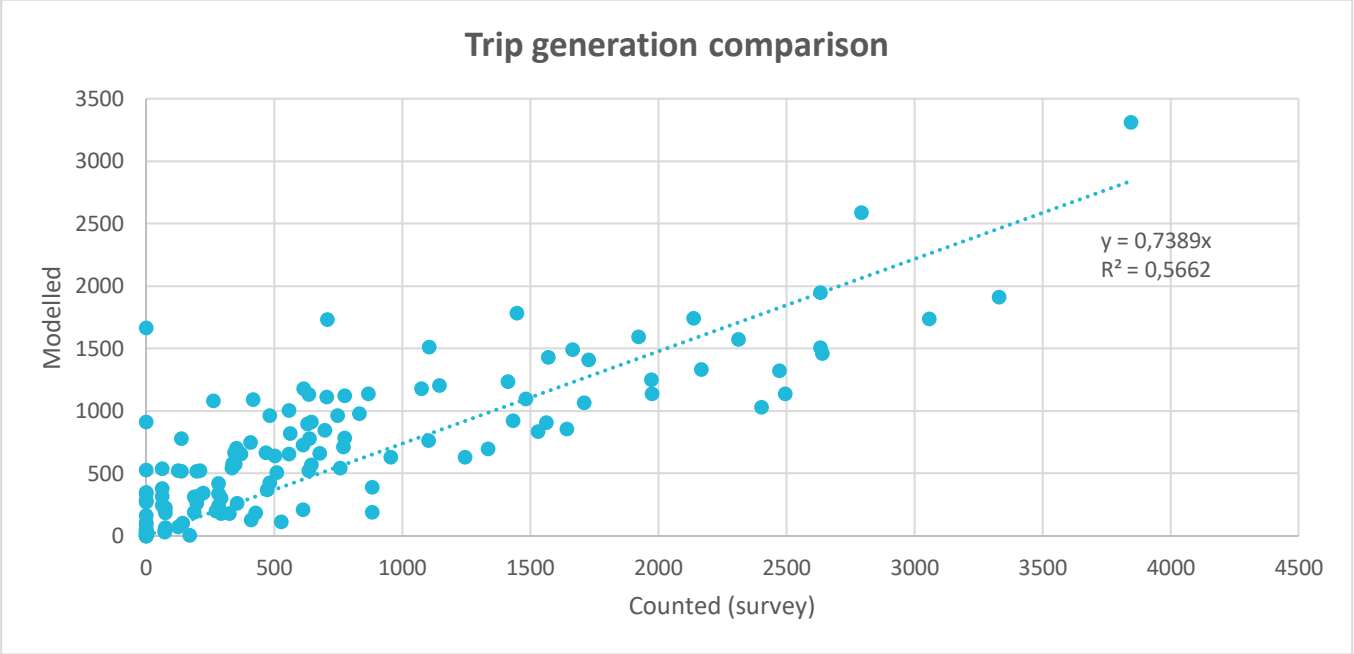
We compare the calibration data i.e., the number of trips produced and attracted by each zone in the survey with the socio economical values to assess the lineal constants $\alpha_j$

In the case of Dire-Dawa, the linear equations that estimate trip production and attraction are as follows:

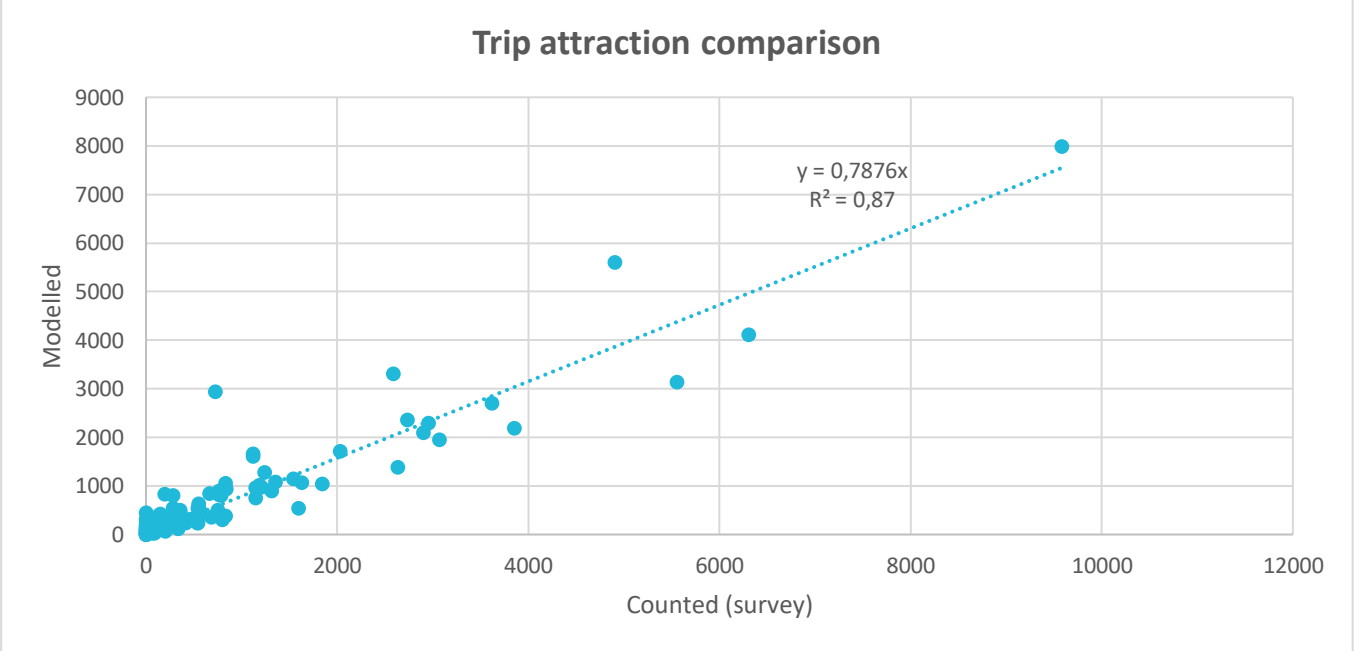
$$Productions_i = 0.2862 \cdot Population_i + 0.0436 \cdot Jobs_i$$

$$Attractions_i = 0.0179 \cdot Population_i + 0.2228 \cdot Jobs_i + 0.3194 \cdot Visitors_i$$

The comparison between the linear estimation and the data collected by the household survey is presented in the following figures.




Linear regression for modelled vs. surveyed trip generation




Linear regression for modelled vs. surveyed trip attraction

## Distribution

We try to explain the flows between each origin and each destination. The gravitational distribution is the most common formula (for a simply constrained model):

$$T_{ij} = K_i \frac{E_i \cdot A_j}{f(c_{ij})}$$

Where:

$f(c_{ij})$: deterrence function, depends on the time and price for example

Power function: $f(c_{ij}) = c_{ij}^{\alpha}$

Exponential function: $f(c_{ij}) = \exp(\beta c_{ij})$

Combined function: $f(c_{ij}) = c_{ij}^{\alpha} \exp(\beta c_{ij})$

$K_i$: adjustment parameter to meet with the constraints. It enables for the sum of the trips originating from a zone to be equal to the productions calculated in the generation step

$$\sum_j T_{ij} = E_i$$

$$K_i = \frac{1}{\sum_j \frac{A_j}{f(c_{ij})}}$$

A doubly constrained distribution can be used when we need to meet with the attraction constraints.

In the case of Dire-Dawa, a combined impedance function was used, for which its parameters were estimated in the calibration process:

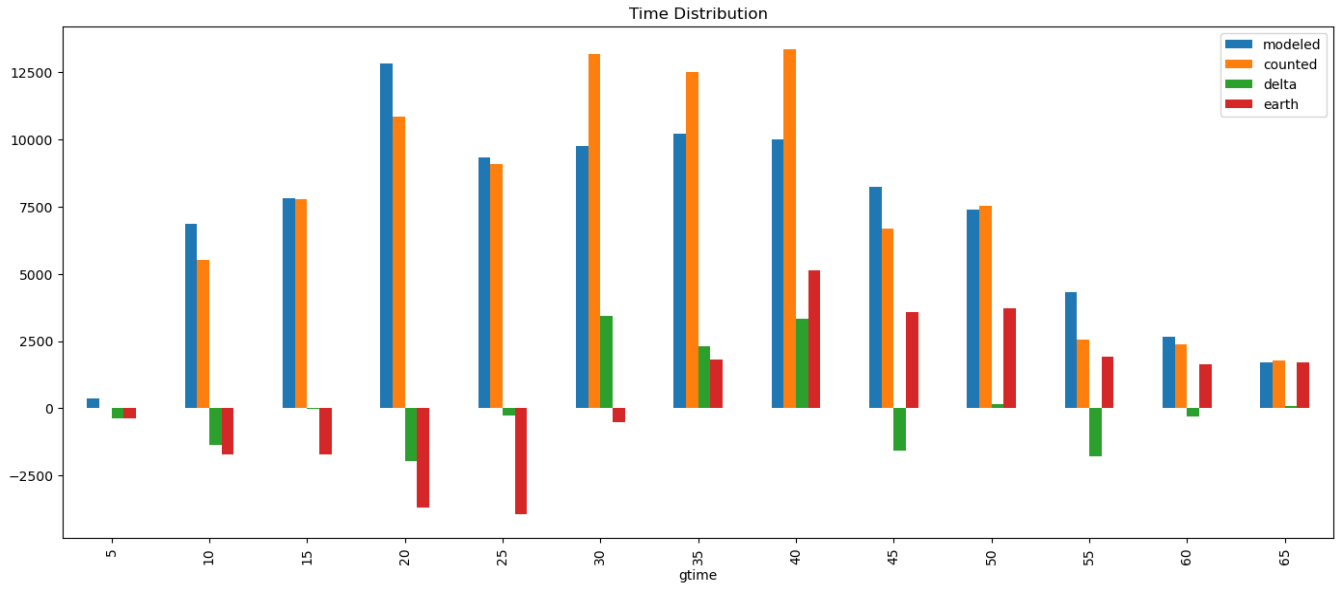
$$f(c_{ij}) = c_{ij}^{-2.5} \exp(-0.25 c_{ij})$$

Where $c_{ij}$ is the generalized time (in hours) between zones.

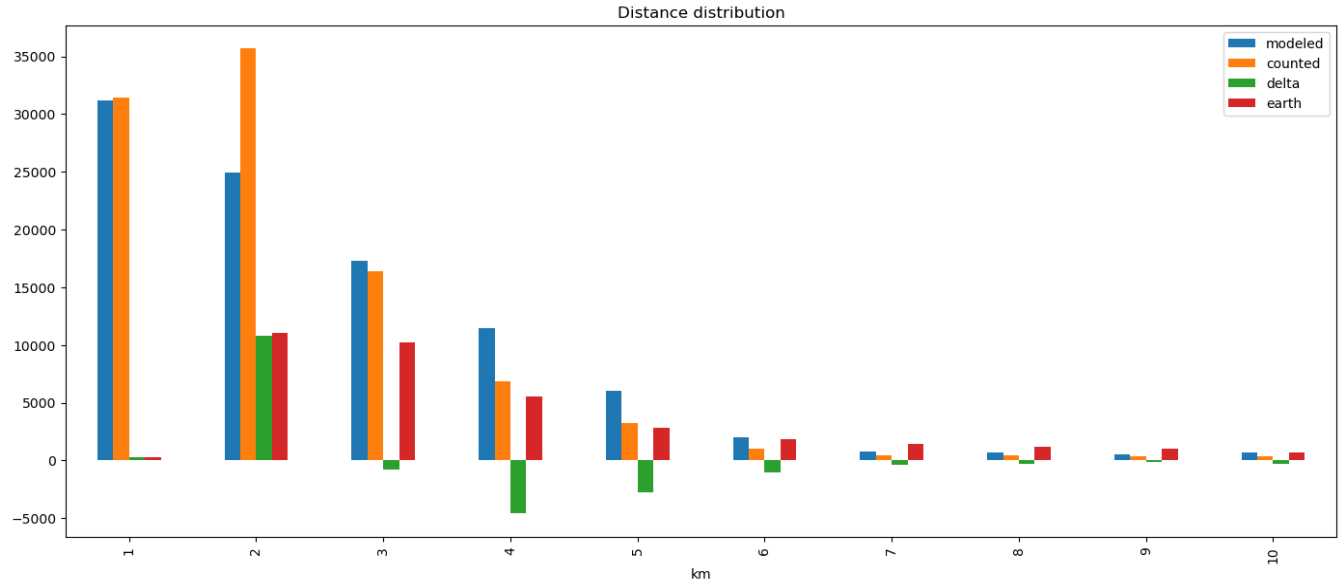
The distribution stage is calibrated using the mobility survey, comparing three main indicators:

- Distribution of distances: number of trips per distance interval.
- Time distribution: number of trips per time interval.
- Volumes between kebeles.

For each distance and time class, the modeled and surveyed volumes are expected to be close. The volumes were compared class by class and the quality of the overall distribution was assessed with a special measure called "earth mover's distance". This comparison allows to choose the parameters of the gravity distribution model.



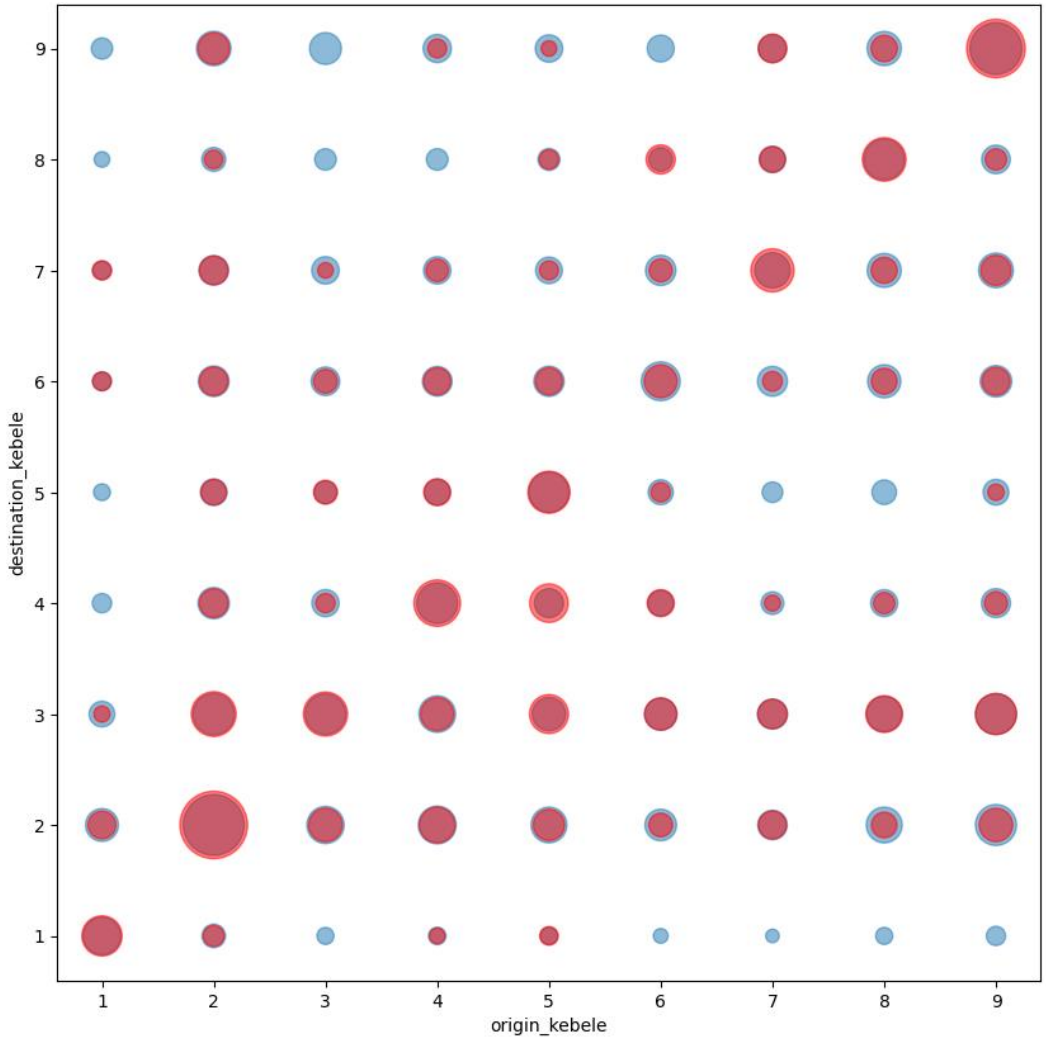
### Modelled and surveyed time distribution comparison




### Modelled and surveyed distance distribution comparison

The figures above show the time and distance distributions of the household survey and the model. While there are some differences in certain distance and time classes, the distributions follow a similar trend, respecting the average surveyed time (36 minutes) and distance (2.2 km).

Regarding the third main indicator, the figure below shows the trip volumes between kebeles: in red the surveyed flows and in red the modelled flows. The size of the circle is proportional to the volume. In general, it can be observed that the modelled volumes are very similar to the surveyed ones. In some cases, there is no red circle (no surveyed volume), which is normal as the sample used for the survey is limited and does not cover all origin and destination pairs even at an aggregated level such as kebeles.




**Modelled and surveyed volumes between kebeles**

## Modal split and assignment

The modal choice model seeks to explain users' decisions regarding the different modes of transport available to them for their journeys. For this purpose, a logit model based on utilities that measure user satisfaction for each mode is used. These utilities are compared and the probability of use of each mode is calculated: the higher the utility of a mode, the higher the probability of use.

In summary, the logit model follows the following formula:

$$P(mode_i) = \frac{e^{U_{mode_i}}}{\sum_j e^{U_{mode_j}}}$$

Where:

$P(mode_i)$: Probability of using mode i

$U_{mode_i}$: Utility of mode i

The utility function must show the user satisfaction for each mode: price, duration of a trip (broken down between waiting, access/egress, and in-vehicle time) and other relevant variables to the user choice. We compute an aggregated average utility for each origin-destination pair:

$$U_{mode,OD} = \alpha_{mode} + \beta_{Time} \cdot Time_{mode,OD} + \gamma_{Fare} \cdot Fare_{mode,OD} + \cdots$$

The logit model is based on a strong assumption: users are rational and choose the mode with the highest utility. Assuming that all users have the same utility, then all the users will choose the same mode. In reality, when there is an alternative, there are always a part of users choosing it even if it seems to be the worst, because there is some variability and bias in user's perception.

Therefore, for each user traveling from zone $i$ to zone $j$, we consider that utility:

$$U_{mode,user,OD} = U_{mode,OD} + \varepsilon_{mode,user,OD}$$

Then:

$$P(user\ choose\ mode_i\ for\ OD) = P\left(U_{mode_i,user,OD} > U_{mode_j,user,OD} \forall j \neq i\right)$$

The logit formulation comes from a Gumbel probability distribution for residual utility $\varepsilon$.

The calibration of the modal choice, i.e. the choice of the coefficients of the utility function, is done by comparing two main indicators:

- Modal split in terms of total trips
- Modal split in terms of pkm

The two explanatory variables of the modal choice model are travel time and fare. The reduction in utility due to transfers was modelled as an increase in travel time in addition to waiting time.

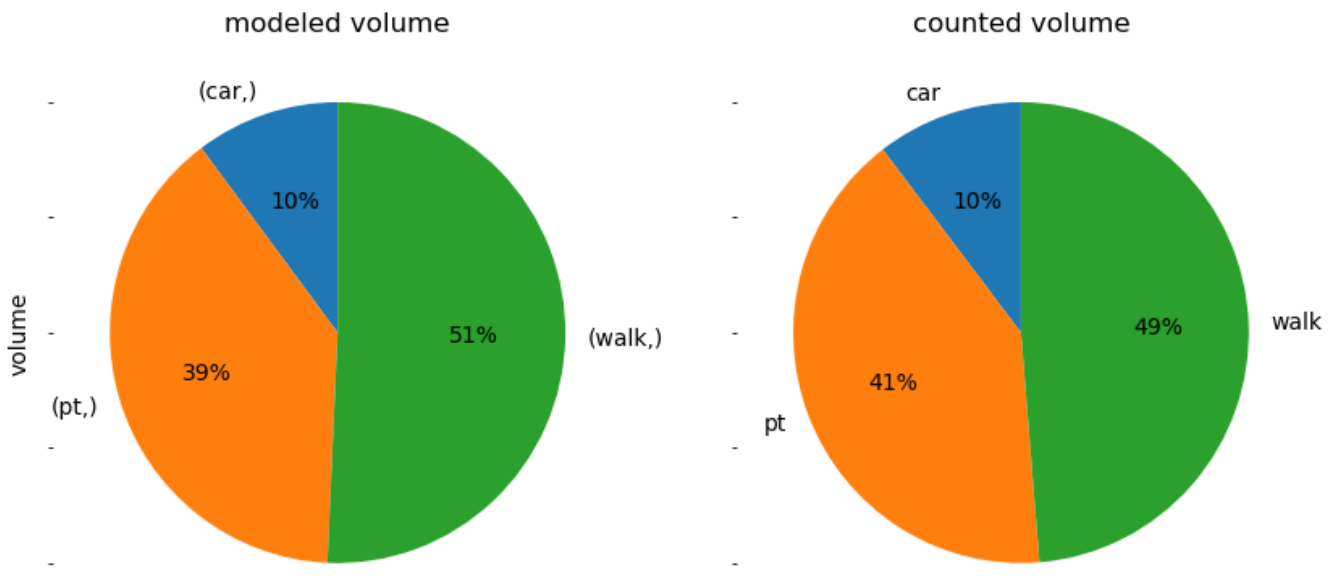
All parameters are initialized with reference values, collected from surveys, field studies and similar models. It follows an iterative procedure, whereby parameters are changed to maximize the similarity between mobility survey indicators and mapping results. The estimated parameters are as follows:

| PARAMETER | VALUE |
|---|---|
| $\beta_{Time}$ [time in s] | -0.00055 |
| $\beta_{Fare}$ [fare in birr] | -0.099 |
| $\alpha_{mode}$ for all modes | 0 |
| Transfer penalty | 300 seconds |

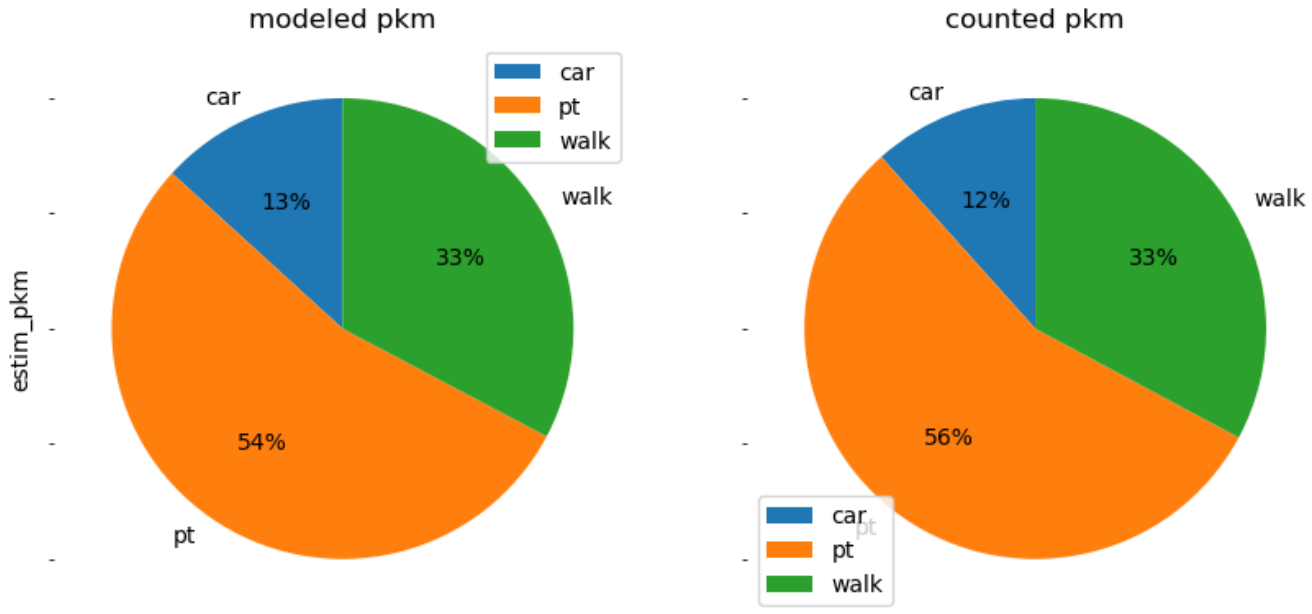
Modal choice model parameters

From cost and time coefficients, a Value of Time of about **20 birr/h** can be estimated. Details of time and cost by mode are described later in this report.

0 shows modal split for both modelled and surveyed volumes. 0 represents modal split in terms of passenger.km (pkm). In both cases, proportions are well represented by the model. However, the model overall presents a higher pkm than counted. Since this indicator is calculated with Euclidean distances (distance as the crow flies between zones centroids), this mismatch between modeled and counted may be due to the overestimation of long trips given at the distribution step.



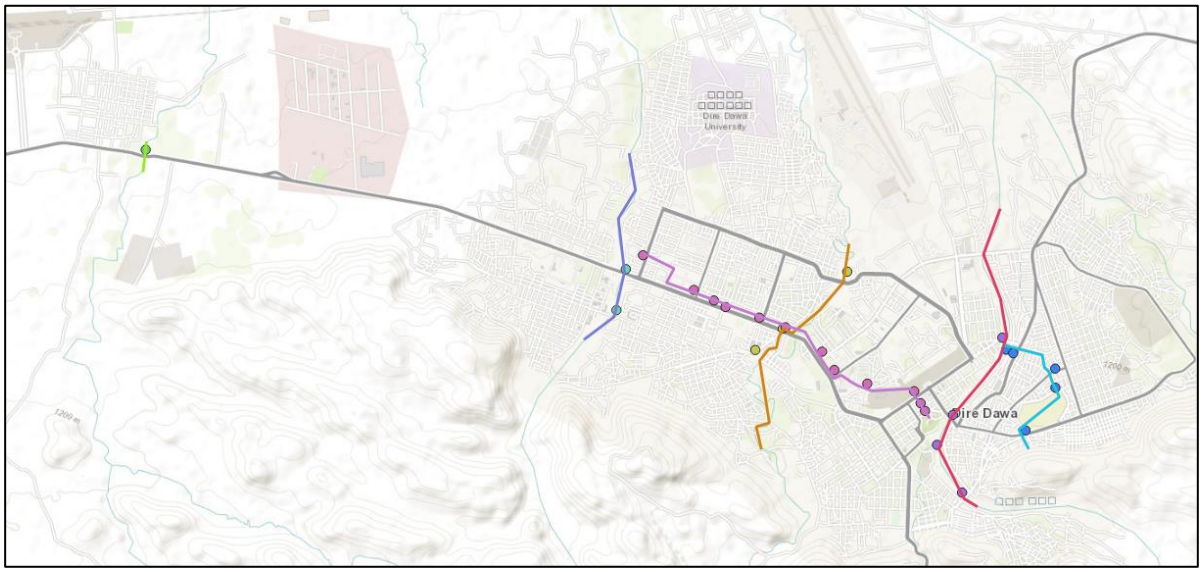

**Modelled and surveyed modal split by volume**




**Modelled and surveyed modal split by passenger.km**

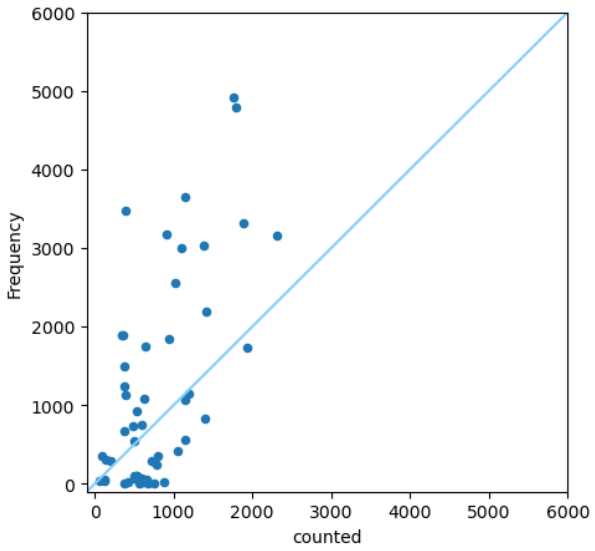
In Quetzal, trip assignment is integrated into the modal choice model, in that the utility of a mode is calculated from the utilities of the routes using that mode, and hence the probabilities of taking a route are calculated from the probabilities of using a mode (see 0). Hence, the parameters to calibrate in the assignment are the same as those already estimated in the modal choice.

However, the trip assignment results allow comparing new calibration indicators, such as the comparison of traffic flows. 0 shows the location of the vehicle count points as well as the screenlines used to aggregate counting points and verify the interchange flows between the different macro-zones of the model.

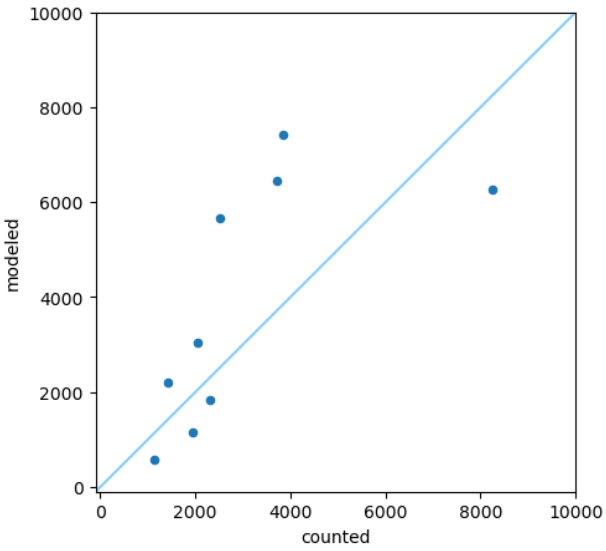



**Counting points and screenlines**

0 shows modelled and counted flows by counting point, and 0 shows aggregated flows by screenlines. There is a tendency to overestimate flows in the model, especially when looking at the graph disaggregated by count points. This may be due to the fact that the model does not take into account the capacity restrictions of the network, i.e. there is no redistribution of routes if certain routes are saturated. The aggregated graph shows a more coherent balance between over- and underestimated flows, which may be more relevant to be considered when assessing the estimation capacity of the model.




**Modelled and counted flows at counting points**




**Modelled and counted flows at screenlines**

## 7.6.4. Main assumptions and limitations

### Demand assumptions

The assumptions assumed for the estimation of demand (population and jobs, urban forms) are detailed in Chapter 2 - Mobility Development Parameters. This chapter explains the methodology for projecting population and jobs, which served as input data for the model.

In terms of zoning, the model has 215 zones, which represent the currently urbanized zones as well as the zones that will be urbanized in the future according to the different urban forms.

### Transport supply assumptions

- **Mode "Car"**

The "car" mode corresponds to the "bajaj contract" in the baseline scenario.

One of the strong assumptions of the model is that no capacity constraint is considered for the calculation of car mode routing utilities. That is, the speed on the road network is constant and does not depend on the flow through the different links (normally, road network links are characterised by a volume-delay function, which represents the speed loss due to congestion effects).

To reproduce the congestion effects, a "loaded" network speed is considered: 15 km/h for the urban network and 25 km/h for the interurban network.

A fixed fare of 30 birr per car journey was set.

- **Mode "Public Transportation"**

The public transport mode in the baseline scenario consists of Bajaj Routes lines. For the future scenarios, three types of services were defined: BRT, buses, and local lines. The frequencies, speeds and capacities are presented in Table 2.

| PT MODE | HEADWAY | SPEED | VEHICLE CAPACITY |
|---|---|---|---|
| **Bajaj (base scenario)** | 3' | = 0.8 x Road Speed | 5 pax/veh |
| **BRT** | 2' | = 1.2 x Road Speed | 160 pax/veh |
| **Bus** | 3' | = 0.8 x Road Speed | 90 pax/veh |
| **Local** | 2' | = 0.8 x Road Speed | 20 pax/veh |

**Public transportation modes attributes**

The definition of public transport lines at the future horizon depends on urban shapes (see Chapter 2 – Mobility Development Parameters).

Although vehicle capacities were defined for the different modes, the model does not consider the capacity constraint for the calculation of utilities. This is a very common assumption in public transport models.

PT speeds depend on road speeds, applying a factor depending on the type of service. It was assumed that BRT, having an exclusive lane, can go slightly faster than the established road speed. For bus/local/bajaj lines, having stops every few metres, the commercial speed will be lower than the established road speed.

The fare for the PT mode was set at 5 birr.

- **Mode "Walk"**

The walk mode times were calculated based on a walking speed of 4 km/h. In addition, a penalty factor of 1.6 (found in the calibration stage) was applied. This penalty factor was improved to 1.15 in future scenarios, which represents the improvement of the pedestrian infrastructure.

*Calibration and modelling limits*

The calibration is valid on a metropolitan geographical scale: it guarantees good confidence in the flows between kebeles and in the structuring modes. However, at the level of populated sectors and neighborhoods, at the level of feeder lines or the secondary network, the results suffer from high uncertainty.

The modal calibration is valid for competition between 3 mode classes:

- Car
- Public Transport
- Walk

But the internal competition between the different modes of each class (for example, between BRT and buses), which have similar speeds and frequencies, suffers from more uncertainty.

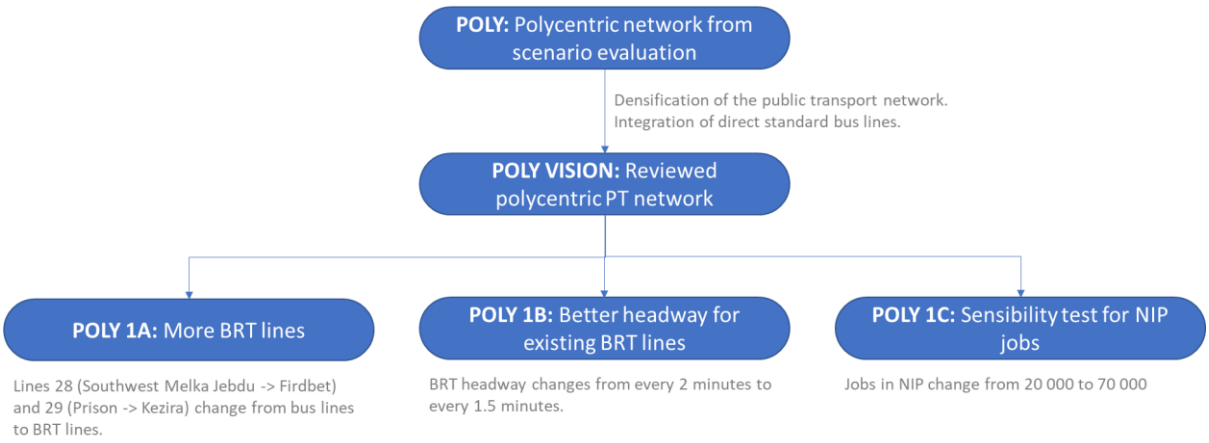
The calibration of the model is based on the mobility survey and the different counts carried out. There is a sampling error, which becomes relevant at the distribution stage, where it is not possible to know in sufficient detail the demand for all OD pairs at the disaggregated zone level. Moreover, the exact location of trip origins and destinations is not always easy to integrate into a pre-established zoning.

The Dire-Dawa model has the particularity that in future horizons, the city will have a different urban shape than today, which makes the model less predictive of mobility behavior. In a city with a new urban structure, mobility behaviors will have to adapt, and people will, for example, be more willing to make longer trips than they are today. However, despite this source of predictive error, the model is a relevant tool to compare different future scenarios under different mobility system configurations.

### 7.6.5. Future scenarios and vision design

The model results for the three future scenarios (scattered city, two cities, polycentric city) are detailed and presented in chapter 4 - Comparison and Evaluation of the Scenarios.

Based on the first evaluation, that led to set the Polycentric City as the target scenario, the construction of the Vision scenario was carried out thanks to different sensitivity tests, as explained in 0.

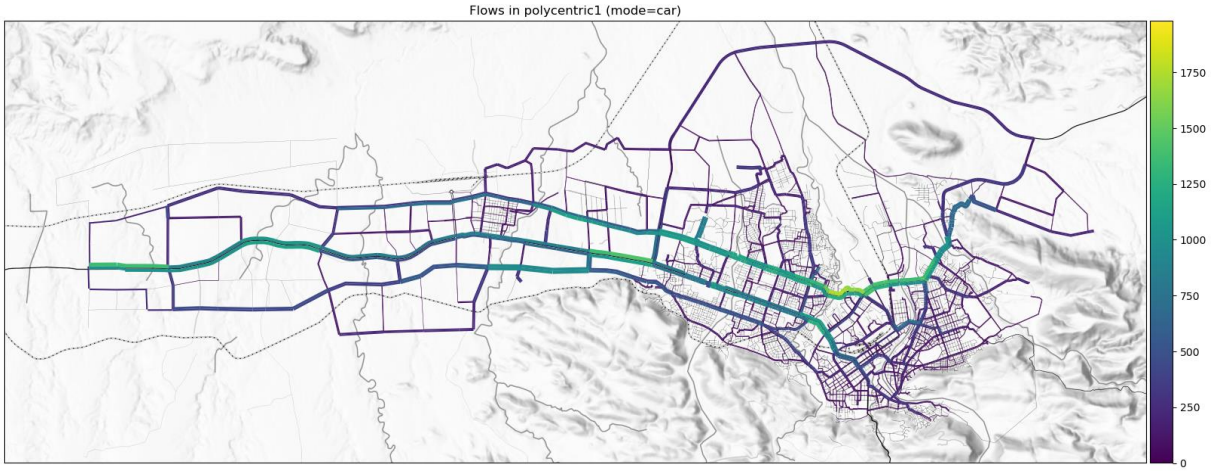



### Construction of polycentric scenario tests

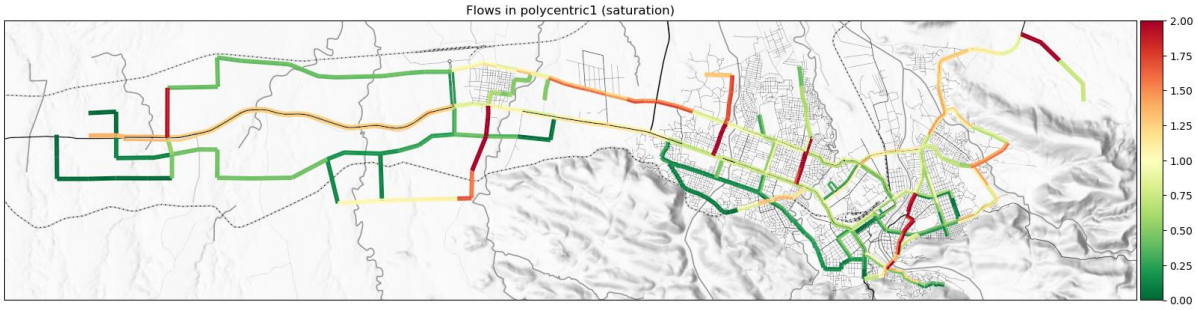
For Polycentric-Vision scenario construction, more direct standard bus lines were added between different origins and destinations to relieve congestion on the central BRT line. For certain origins and destinations, users make the choice between a fast line with transfers (BRT + feeder buses) or a standard but direct bus line.

The Vision scenario shows improvements over the previous polycentric scenario. The BRT lines are less saturated and the relevance of standard bus lines parallel to the BRT is noted, especially in the Seido sector.

Figure 15 shows the network loaded with vehicular flows and Figure 16 shows the saturation rates of public transport flows. The east-west road infrastructures are the most demanded in terms of vehicle volumes. In terms of public transport, while the BRT lines absorb most of the demand as the backbone of the system, it is some sections of the north-south lines that show the highest saturation rates, as they function as feeder lines to the BRT but have a lower capacity.



**Loaded network for mode CAR**




**Saturation rate for mode PT**

## o Sensibility tests

The POLY1A and POLY1B scenarios present similar indicators in terms of distance and time, as they present changes in the transport network and not in the urban organization of the city.

The POLY1A and POLY1B scenarios were aimed at decongesting the main axis of the public transport network (BRT). Thus, the saturation maps show better results in the POLY1B scenario (BRT with higher headway), where saturation levels are not as high for the lines parallel to the BRT (standard bus lines 28 and 29). However, the problem with this scenario is at the operational level: the central trunk of the three BRT lines would have articulated buses every 30 seconds which is not acceptable regarding operation nor realistic.

The POLY1A and POLY1B scenarios do not present improvements on congestion problem of the BRT line connecting to the New Industrial Park, nor do they solve other saturation problems on, for example, line 11 (local) or line 20 (local).

The test on jobs in the New Industrial Park shows a low sensitivity of the model to this variable. 50,000 new jobs were added (compared to 20,000 initially considered by the model) and only 2,200 new trips were generated. However, the attractiveness of the New Industrial Park increases, and this causes the lines arriving at the NIP to increase their demand.

## 7.7. Data reporting template for monitoring and evaluation

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **1. Structure and develop a hierarchised road network supporting the growth of a compact city and efficient mobility flows** | Average travel time per trip | impact | minutes | DDW inhabitants | 10 years | Calculation of average travel time per trip. Understood | Household survey according to established protocols |
| | Mobility rate (global, Kebele level) | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person | Household survey according to established protocols |
| | GHG emissions per year per inhabitant | impact | CO2 eq per year per inhab. | DDW | 10 years | Total over transport modes of annual veh.km per mode multiplied by the emission factor per mode | For TP modes: operator data<br>For private modes: counts, calculation after household survey processing. |
| | Noise pollution | impact | dB | DDW | 5 years | Noise measurements in specific points with special instrumentation | Noise measurements in specific points with special instrumentation |
| | Air pollution | impact | ton | DDW | 5 years | Total over transport modes of annual veh.km per mode multiplied by the emission factor per mode and per pollutant (NOx, PM10, PM2,5, COV, SO2, benzene) | Depends on period:<br>- Yearly : By odometer measures<br>- 5 years : Household survey + reduced surveys)<br>- 10 years : Household surveys |
| | Road travel time on typical routes | outcome | minutes | DDW road network | 5 years | Average of road travel time between established OD | Time records by floating car data method |
| | Congestion rate | impact | % | DDW road network | 5 years | Maximum peak hour traffic flow divided by the nominal capacity of the road axis. Estimation of capacity from | Traffic counts |
| | Production of guidelines | output | guidelines | DDW | Yearly | Number of guidelines produced | City of Dire Dawa (Road Authority) Report |
| | Update of guidelines | output | guidelines | DDW | Yearly | Number of updatedguidelines | City of Dire Dawa (Road Authority) Report |
| | Guidelines integrated in road design ToR | outcome | guidelines | DDW | Yearly | Number of guidelines integrated in road design ToR | City of Dire Dawa (Road Authority) Report |
| | Implementation of guidelines in road project | outcome | guidelines | DDW | Yearly | Number of guidelines implemented in road projects | City of Dire Dawa (Road Authority) Report |
| | Production of road maintenance plan | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of a road maintenance plan |
| | Production of maintenance organisation routine | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of maintenance organisation routine |
| | Traffic fatalities | impact | fatalities per year | DDW | Yearly | Number of road fatalities per year | fatalities reported to the traffic police |
| | Number of km of roads upgraded/built per year per category | output | km | DDW road network | 5 years | Number of km of roads upgraded/built per year per category | National (or Local) Road Authority annual report |
| | Practicability of road | outcome | score | DDW | 5 years | Scale of 1 to 5:<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent<br>To be considered: profile continuity, ground obstacles, surface quality, actual capacity / theoretical capacity | Field visits with an adapted weighted evaluation grid |
| | Practicability in all weather conditions | outcome | score | DDW | 5 years | Scale of 1 to 5:<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent<br>To be considered: profile continuity, ground obstacles, surface quality, actual capacity / theoretical capacity, floodplains | Field visits with an adapted weighted evaluation grid |
| | Articulate and homogenous road layout | outcome | score | DDW | 5 years | Scale of 1 to 5:<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent | Field visits with an adapted weighted evaluation grid |
| | Number of km of crossroads upgraded / built per year per category | output | km | DDW road network | 5 years | Number of km of crossroads upgraded / built per year per category | National (or Local) Road Authority annual report |
| | Improvement of road condition | outcome | % | DDW | 5 years | Evolution of practicability of road indicator | Indicator "practicability of road" |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| 2. Implement comprehensive road axis management supporting fluid mobility and integrated uses | Average travel time per trip | impact | minutes | DDW inhabitants | 10 years | Calculation of average travel time per trip. Understood | Household survey according to established protocols |
| | Mobility rate (global, Kebele level) | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person | Household survey according to established protocols |
| | Modal share of NMT | outcome | % | DDW inhabitants | 10 years | Trips made in NMT modes divided by the total number | Household survey according to established protocols |
| | GHG emissions per year per inhabitant | impact | CO2 eq per year per inhab. | DDW | 10 years | Total over transport modes of annual veh.km per mode multiplied by the emission factor per mode | For TP modes: operator data<br>For private modes: counts, calculation after household survey processing. |
| | Noise pollution | impact | dB | DDW | 5 years | Noise measurements in specific points with special instrumentation | Noise measurements in specific points with special instrumentation |
| | Air pollution | impact | ton | DDW | 5 years | Total over transport modes of annual veh.km per mode multiplied by the emission factor per mode and per pollutant (NOx, PM10, PM2,5, COV, SO2, benzene) | Depends on period:<br>- Yearly : By odometer measures<br>- 5 years : Household survey + reduced surveys)<br>- 10 years : Household surveys |
| | Number of traffic light regulated road intersections | output | traffic lights | DDW road network | Yearly | Number of traffic light regulated road intersections | Mobility Committee report |
| | Setting a traffic unit | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Mobility Committee organization |
| | Number of staff of traffic unit | output | persons | DDW | Yearly | Number of people working on the traffic unit | Mobility Committee organization |
| | Number of crossroads remotely monitored | output | crosroads | DDW road network | Yearly | Number of crossroads remotely monitored | Mobility Committee report |
| | Congestion rate | impact | % | DDW road network | 5 years | Maximum peak hour traffic flow divided by the nominal capacity of the road axis. Estimation of capacity from | Traffic counts |
| | Road travel time | outcome | minutes | DDW road network | 10 years | Calculation of average travel time for trips made by car | Household survey according to established protocols |
| | km of roads adressed through the Circulation Plan | output | km | DDW | Yearly | Number of km integrated in the Circulation Plan | Circulation Plan evaluation |
| | Approval of a Circulation Plan | output | boolean | DDW | Yearly | 1 - True<br>0 - False | approval of a Circulation Plan |
| | Appraisal of the Circulation Plan | output | boolean | DDW | Yearly | 1 - True<br>0 - False | appraisal of the Circulation Plan |
| | Revision of the Circulation Plan | output | boolean | DDW | Yearly | 1 - True<br>0 - False | revision of the Circulation Plan |
| | Traffic fatalities | impact | fatalities per year | DDW | Yearly | Number of road fatalities per year | fatalities reported to the traffic police |
| | Number of traffic police | output | persons | DDW | Yearly | Number of traffic police | Traffic police (human ressources) annual report |
| | Number of km of axis adressed | output | km | DDW road network | 5 years | Number of kilometers adressed on road axis upgrade | National (or Local) Road Authority annual report |
| | Road capacity | outcome | veh/h | DDW road network | 5 years | Nominal capacity: estimation from known values, considering the number of lanes and road conditions.<br>effective capacity: estimation from speed-volume data regressions. | for effective capacity calculation: vehicle counts and peak hour speed measurement |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **3. Structure and develop paratransit as a component of the mobilty system** | Disposable average income spent on public transport | impact | % | DDW inhabitants | 10 years | Average household expense on transport divided by total household income | Household survey according to established protocols |
| | Modal share of public transportation | impact | % | DDW inhabitants | 10 years | Trips made in PT modes divided by the total number of | Household survey according to established protocols |
| | Fare predictability (deviation from the mean) | outcome | ETB | DDW | 5 years | Surveys on the price paid for a trip. Data processing to establish the mean and variance of standardised | Field visits with paratransit supply surveys |
| | Average waiting time off peak or at night | outcome | minutes | DDW | 5 years | Waiting time measurements in off-peak hours and at night. Data processing to calculate the average. | Field visits with paratransit supply surveys |
| | Number of technical controls carried out each year | output | technical controls | DDW | Yearly | Total number of technical controls carried out each year (per operator) | Paratransit operators maintenance reports |
| | Creation of a label / certification / QOS charter | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of a label / certification / QOS charter |
| | Number/share of drivers/operator staff trained | output | % | DDW | Yearly | Number of drivers/operator staff trained (share/ divided by total drivers/operators) | Paratransit Transition Plan evaluation |
| | Number/share of drivers comitted to the QOS charter | output | % | DDW | Yearly | Number of drivers comitted to the QOS charter (share: divided by total paratransit drivers) | QOS charter reporting |
| | Number of vehicle purchase through shared processes | output | vehicles | DDW | Yearly | Number of vehicle purchase through shared processes | Paratransit Transition Plan evaluation |
| | Creation of paratransit app | output | downloads | DDW | Yearly | Number of paratransit app downloads from digital | Paratransit App statistics from digital platforms |
| | Number/share of associations/drivers engaged into transition | output | % | DDW | Yearly | Number of associations / drivers involved into transition (share: divided by total paratransit | Paratransit Transition Plan evaluation |
| | Number of insurance policies issued in the sector | output | insurance policies | DDW | Yearly | Number of insurance policies issued in the sector | Paratransit Transition Plan evaluation |
| | Number of fines relating to non-compliance with traffic regulations by paratransit workers | output | fines | DDW | Yearly | Number of fines relating to non-compliance with traffic regulations by paratransit workers | Transport Authority annual report |
| | Number/share of the fleet converted into clean or new vehicles | outcome | % | DDW | Yearly | Number/share of the fleet converted into clean or new vehicles | Paratransit Transition Plan evaluation, Paratransit operators |
| | Number of trainings delivered | output | trainings | DDW | Yearly | Number of trainings delivered | Paratransit Transition Plan evaluation |
| | Level of pax satisfaction | outcome | score | DDW inhabitants | 5 years | Scale of 1 to 5 (1 = very dissatisfied, 5 = very satisfied) | User perception/satisfaction survey |
| | Security perception | outcome | score | DDW inhabitants | 5 years | Scale of 1 to 5 (1 = very insecure, 5 = very secure) | User perception/satisfaction survey |
| | Security index (accidents, theft, harassment) | outcome | qualitative | DDW inhabitants | 5 years | Number of accidents/ thefs/ harassment per 10000 inhabitants | Reported cases of accidents, theft, harassment to the Transport Authority |
| | Share of women participation to operation workforce | outcome | % | DDW | Yearly | Number of women divided by total operation workforce | Transport authority (human ressources) annual reporting |
| | Mobility rate per type of public, including women, elders, person with reduced mobility, person with limited resources | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person per type of public | Household survey according to established protocols |
| | Local service coverage extension | outcome | km | DDW transport network | Yearly | Number of km of local lines | Operators and Transport Authority information |
| | PT network coverage | output | % | DDW transport network | 5 years | Proportion of the population living within 500 meters of a public transport stop with a minimum average 20- | Georeferenced local authority demographic data and stop locations in GIS format. |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| 4. Provide a mass transit backbone supply to care for increasing demand and support urban growth | Disposable average income spent on public transport | impact | % | DDW inhabitants | 10 years | Average household expense on transport divided by total household income | Household survey according to established protocols |
| | Average travel time per day | outcome | minutes | DDW inhabitants | 10 years | Calculation of average travel time, per day. Understood as the average of the time dedicated to mobility daily | Household survey according to established protocols |
| | Daily ridership over integrated services | impact | pax/day | DDW integrated services | 5 years | Daily total validations on integrated services (or daily passenger counts) | Counts or validation data from PT lines operators |
| | Mobility rate (global, Kebele level) | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person | Household survey according to established protocols |
| | Daily ridership for bus network | impact | pax/day | DDW bus lines | 5 years | Daily total validations on bus lines (or daily passenger | Counts or validation data from PT lines operators |
| | Modal share of public transportation | impact | % | DDW inhabitants | 10 years | Trips made in PT modes divided by the total number of | Household survey according to established protocols |
| | PPHPD max. | outcome | lines | DDW PT lines | 5 years | Maximum number of ticket validations carried out in | Counts or validation data from PT lines operators |
| | Modal shift to PT modes | outcome | % | DDW inhabitants | 10 years | Trips that were made by walking (and are now made by | Household survey according to established protocols |
| | Average mobility expenses | impact | ETB | DDW inhabitants | 10 years | Average household expense on transport | Household survey according to established protocols |
| | GHG emissions per year per inhabitant | impact | CO2 eq per year per inhab. | DDW | 10 years | Total over transport modes of annual veh.km per mode multiplied by the emission factor per mode | For TP modes: operator data<br>For private modes: counts, calculation after household survey processing. |
| | Noise pollution | impact | dB | DDW | 5 years | Noise measurements in specific points with special instrumentation | Noise measurements in specific points with special instrumentation |
| | Yearly CAPEX | output | MUSD | DDW | Yearly | Total annual investment | Annual stakeholder reports |
| | Coverage ratio for the PT network | outcome | ratio | DDW | 5 years | PT generated incomes / (CAPEX + OPEX for PT network) | Mobility Committee budget annual report |
| | Yearly OPEX | output | MUSD | DDW | Yearly | Total operating costs | Annual operator reports |
| | fare revenue of integrated system | output | ETB | DDW | Yearly | Total PT generated revenues of the integrated system | Annual stakeholders results reports |
| | CAPEX of ticketing system | output | MUSD | DDW | 5 years | Total annual investment for implementing ticketing | Mobility Committee budget annual report |
| | OPEX of ticketing system | output | MUSD | DDW | 5 years | Total operating costs for implementing ticketing system | Mobility Committee budget annual report |
| | Commercial revenues of the network | outcome | ETB | DDW | Yearly | Total revenues | Annual operator reports |
| | Road travel time | outcome | minutes | DDW road network | 10 years | Calculation of average travel time for trips made by car | Household survey according to established protocols |
| | BRT/car travel time on served routes | outcome | ratio | DDW road network | 5 years | Total travel time for each BRT line divided by floating car time records folowing the same route in road | Time records by floating car data method |
| | Share of paratransit units reallocated/compensated | outcome | % | DDW | Yearly | Number of paratransit units reallocated or compensated into bus lines divided by total paratransit | Paratransit Transition Plan evaluation, Bus Network Plan |
| | Mass Transit Plan | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Approval of a Mass Transit Plan |
| | Appraisal of the Mass Transit Plan | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Appraisal of the Mass Transit Plan |
| | Revision of the Mass Transit Plan | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Revision of the Mass Transit Plan |
| | Service ratings by users | outcome | score | DDW inhabitants | 5 years | Scale of 1 to 5 (1 = very dissatisfied, 5 = very satisfied) | User perception/satisfaction survey |
| | Traffic fatalities | impact | fatalities per year | DDW | Yearly | Number of road fatalities per year | fatalities reported to the traffic police |
| | Mobility rate per type of public, including women, elders, person with reduced mobility, person with limited resources | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person per type of public | Household survey according to established protocols |
| | Savings allowed by fare integration in regard of single tickets for traveller | outcome | ETB | DDW | 5 years | Considering mobility behavior (trip chains, mobility rate), calculate daily fare with fare integration and | Integrated fare system and Household survey according to established protocols |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **4. Provide a mass transit backbone supply to care for increasing demand and support urban growth** | Quantity of operating BRT vehicles | output | BRT vehicles | DDW transport network | Yearly | Number of BRT vehicles in operation | Operators and Transport Authority information |
| | Linear of BRT infrastructure | output | km | DDW transport network | Yearly | Number of km of dedicated lane infrastructure | Operators and Transport Authority information |
| | Number of integrated services | output | services | DDW transport network | 5 years | Number of PT services included in the PT ifare integration | Mobility Committee integration report |
| | Number of corresponding units | output | units | DDW transport network | 5 years | Nu,ber of vehicle units included in the fare integration | Mobility Committee integration report |
| | Kilometers of bus lines implemented | output | km | DDW transport network | Yearly | Number of km of bus lines | Operators and Transport Authority information |
| | Quantity of operating bus units | output | bus units | DDW transport network | Yearly | Number of bus units in operation | Operators and Transport Authority information |
| | km of BRT lines implemented | output | km | DDW transport network | Yearly | Number of km of BRT lines | Operators and Transport Authority information |
| | PT network coverage | output | % | DDW transport network | 5 years | Proportion of the population living within 500 meters of a public transport stop with a minimum average 20-minute service | Georeferenced local authority demographic data and stop locations in GIS format. |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **5. Confort and promote non-motorized transports** | Number of bikes delivered | output | bikes | DDW | Yearly | Number of bikes delivered to target populations | Mobility Committee annual report |
| | Creation of a Cycling Association | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of Cycling Association |
| | Number of members of cycling association | output | members | DDW | Yearly | Number of members into the cycling association | Adding members to database during the subscription process |
| | Number of bike rides | outcome | rides/day | DDW | 5 years | Bike counts at key points in the city (where bike flows are significant). Daily average during the week | On-site counts of bicycles during one week at specific locations |
| | Satisfaction from bike users | outcome | score | DDW | 5 years | Scale of 1 to 5 (1 = very dissatisfied, 5 = very satisfied) | User perception/satisfaction survey |
| | Disposable average income spent on public transport | impact | % | DDW inhabitants | 10 years | Average household expense on transport divided by total household income | Household survey according to established protocols |
| | Density of the pedestrian network by kebele | outcome | km/ha | DDW | 5 years | GIS treatment to calculate the number of kilometres of pedestrian network in good condition in relation to the total area of the kebele. | Update of GIS data according to the progress of projects by the Mobility Committee. |
| | Modal share of walk | impact | % | DDW inhabitants | 10 years | Trips made by walk divided by the total number of trips | Household survey according to established protocols |
| | Mobility rate (global, Kebele level) | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person (per kebele and global) | Household survey according to established protocols |
| | Average mobility expenses | impact | ETB | DDW inhabitants | 10 years | Average household expense on transport | Household survey according to established protocols |
| | Share of NMT measures in projects overall capex | 0 | % | DDW | 5 years | CAPEX for NMT measures divided by overall CAPEX | Mobility Committee budget annual report |
| | Annual CAPEX dedicated to walking | output | MUSD | DDW | Yearly | Total annual investment on pedestrian projects | Annual stakeholder reports |
| | Annual OPEX dedicated to walking | output | MUSD | DDW | Yearly | Total operating costs of pedestrian projects | Annual operator reports |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| 5. Confort and promote non-motorized transports | %PT stations with proper walking access | outcome | % | DDW | 5 years | GIS treatment of the areas of influence of PT stations (500m for BRT, 200m for bus). Classification of the pedestrian network based on the Walking Rating Index - cf. Safe Access Manual, EMBARQ:<br>Scale of 1 to 5:<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent<br>PT station qualified Good or Excellent / total PT stations | Field visits with an adapted weighted evaluation grid |
| | Number of communication campaign per year | output | communication campaigns | DDW | Yearly | Number of communication campaigns | Mobility Committee (communication department) annual report |
| | Number of trainings delivered about pedestrian approach | output | trainings | DDW | Yearly | Number of trainings delivered about pedestrian approach | Mobility Committee pedestrian report |
| | Number of training hours about pedestrian approach | output | hours | DDW | Yearly | Number of training hours about pedestrian approach | Mobility Committee pedestrian report |
| | Number of tools (methodologies, processes, guidelines, etc.) about pedestrian approach | output | tools | DDW | Yearly | Number of tools (methodologies, processes, guidelines, etc.) about pedestrian approach | Mobility Committee pedestrian report |
| | Number of trained personnel | output | % | DDW | Yearly | Number of drivers/operator staff trained (share/ divided by total drivers/operators) | Paratransit Transition Plan evaluation |
| | Architectural competition for major NMT project | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existance of an Architectural competition for major NMT project |
| | Walking users' perception | impact | score | DDW inhabitants | 5 years | Scale of 1 to 5 (1 = very dissatisfied, 5 = very satisfied) | User perception/satisfaction survey |
| | Walkers injuries/fatalities | impact | injuries/fatalities | DDW | Yearly | Number of walkers injuries/fatalities | walkers injuries/fatalities reported to the traffic police |
| | Number of walking communication events | output | events | DDW | Yearly | Number of walking communication events per year | Mobility Committee (communication department) annual report |
| | Number of schools involved in pedibus activities | output | schools | DDW | Yearly | Number of schools involved in pedibus activities (shared walks to bring schoolchildren to school) | Mobility Commity pedestrian annual report |
| | Mobility rate per type of public, including women, elders, person with reduced mobility, person with limited resources | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person per type of public | Household survey according to established protocols |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **5. Confort and promote non-motorized transports** | %public facilities with proper walking access | outcome | % | DDW | 5 years | GIS treatment of the areas of influence of public facilities (100m). Classification of the pedestrian network based on the Walking Rating Index - cf. Safe Access Manual, EMBARQ:<br>Scale of 1 to 5:<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent<br>public facilities qualified Good or Excellent / total facilities | Field visits with an adapted weighted evaluation grid |
| | Number of cycling lessons per year | output | lessons | DDW | Yearly | Number of cycling lessons per year | Mobility Committee (communication department) annual report |
| | Number of drivers training per year | output | trainings | DDW | Yearly | Number of drivers training per year | Mobility Committee (communication department) annual report |
| | Number of members into the walkers association | output | persons | DDW | Yearly | Number of members into the walkers association | Adding members to database during the subscription process |
| | Contribution of Walkers Association to projects | output | projects | DDW | 5 years | Number of project where the walkers association is contribution/implicated | Mobility Committee annual report (projects) |
| | km sidewalk upgraded | output | km | DDW pedestrian network | Yearly | Number of km sidewalk upgraded | Transport Authority annual report |
| | km sidewalk developed | output | km | DDW pedestrian network | Yearly | Number of km sidewalk developed | Transport Authority annual report |
| | km continuous walking facilities | output | km | DDW pedestrian network | Yearly | Number of km continuous walking facilities | Transport Authority annual report |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **6. Set up an efficient urban logistic system** | Daily ridership (vehicles) | outcome | veh | Freight centers | Yearly | Number of daily vehicles in freight centers | Freight Centers annual reporting |
| | Good losses declared | impact | losses | DDW | Yearly | Number of good losses declared onFreight Centers | Freight Centers annual reporting |
| | Satisfaction of urban market area users | impact | score | DDW | 5 years | Scale of 1 to 5 (1 = very dissatisfied, 5 = very satisfied) per service | User perception/satisfaction survey. Breakdown by type of inhabitant (users, trader...) |
| | Urban renewal generated in the area | impact | ratio | DDW | 5 years | Number or surface area of cadastral operations in the area, standardised at city level | Georeferenced local authority demographic data and area location in GIS format. |
| | m of delivery area (urban) | output | m | DDW | 5 years | Calculation by GIS processing of the total linear metres of delivery areas | Transport authority regulation reporting |
| | Number of urban consolidation centres | output | sqm | DDW | 5 years | Capacity (sqm) of urban consolidation centres | Consolidation centers reporting |
| | Total truck parking capacity | output | places | Freight centers | Yearly | Total number of parking places in freight centers | Freight Centers annual reporting |
| | Warehouse capacity | output | sam | Warehouse | Yearly | Capacity (sqm) calculated per year | Warehouse annual reporting |
| | Freight vehicle fleet structure desagregated per type of goods | impact | % | DDW | 5 years | Percentage of vehicle type according to the type of goods | Freight Centers annual reporting |
| | Yearly tonnage of input/output/transhipped cargo | outcome | ton | Freight centers | Yearly | Sum of incoming, outgoing and transhipped tonnage by freight center | Freight Centers annual reporting |
| | Warehouse occupation | outcome | % | Warehouse | Yearly | % average occupation calculated per year | Warehouse annual reporting |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **6. Set up an efficient urban logistic system** | Walkability index over the perimeter | output | index | Freight Perimeter | 4 years | GIS treatment of the perimeter. Classification of the pedestrian network based on the Walking Rating Index - cf. Safe Access Manual, EMBARQ:<br>Scale of 1 to 5:<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent<br>PT station qualified Good or Excellent / total PT stations | Field visits with an adapted weighted evaluation grid |
| | Logistic Center implementation | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Implementation of a Logistic Center |
| | Average time desagregated per type of goods | impact | hours | DDW | 5 years | Average distribution time per type of goods | OD Freight Survey according to established protocols |
| | Average cost desagregated per type of goods | impact | ETB | DDW | 5 years | Average distribution cost per type of goods | OD Freight Survey according to established protocols |
| | Average dwelling time | outcome | minutes | Freight centers | Yearly | Calculation of average parking time in freight center, from arrival and departure time data | Freight Centers annual reporting |
| | Perimeter under specific traffic regulation | output | sqm | DDW | 5 years | Calculation by GIS processing of the perimeter in sqm under specific traffic regulation | Transport authority regulation |
| | Road accidents due to freight | outcome | incidents/accidents | DDW | Yearly | Number of road accidents/incidents in the freight perimeter | incidents/accidents reported to the traffic police |
| | Volume of trips to/from the perimeter per day | outcome | trips | Freight Perimeter | 10 years | Daily average number of freight trips surveyed | OD Freight Survey according to established protocols |
| | Time distribution of trips to/from the perimeter per day | outcome | time slots | Freight Perimeter | 10 years | Time slots where there are logistical flows | OD Freight Survey according to established protocols |
| | Average duration of trips to/from the perimeter of the urban logistic project, per day | outcome | minutes | Freight Perimeter | 10 years | Average travel time for freight trips according to the survey | OD Freight Survey according to established protocols |
| | Congestion rate | impact | % | DDW road network | 5 years | Maximum peak hour traffic flow divided by the nominal capacity of the road axis. Estimation of capacity from known values according to number of lanes. | Traffic counts |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **7. Integrate transport and mobility strategies and actions** | Disposable average income spent on public transport | impact | % | DDW inhabitants | 10 years | Average household expense on transport divided by total household income | Household survey according to established protocols |
| | Daily ridership of the hub | outcome | pax/day | Hubs | 5 years | daily passenger volume count at each of the hubs | Counts or validation data from hub's operators |
| | Daily ridership of connected lines | outcome | pax/day | DDW PT lines | 5 years | Daily total validations per connected line | Counts or validation data from PT lines operators |
| | Modal share of terminal trips to/from BRT | outcome | % | DDW | 5 years | Number of first or last mile trips made with a certain mode divided by twice the number of total trips surveyed | Household surveys<br>OD Surveys<br>Validation (ticketing) data (if available) |
| | Share of multimodal trips | outcome | % | DDW inhabitants | 10 years | Number of trips made by 2+ modes / Number of total trips | Household survey according to established protocols |
| | Average travel time per day | outcome | minutes | DDW inhabitants | 10 years | Calculation of average travel time, per day. Understood as the average of the time dedicated to mobility daily for each inhabitant. | Household survey according to established protocols |
| | Average distance per day | outcome | km | DDW inhabitants | 10 years | Calculation of average distance, per day. Understood as the average of the distance run daily for each inhabitant. | Household survey according to established protocols |
| | Daily ridership over integrated services | impact | pax/day | DDW integrated services | 5 years | Daily total validations on integrated services (or daily passenger counts) | Counts or validation data from PT lines operators |
| | Mobility rate (global, Kebele level) | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person (per kebele and global) | Household survey according to established protocols |
| | Connexion rate | outcome | dimensionless | DDW PT lines | 10 years | Number of daily boardings / daily number of trips | Counts or validation data from bus lines operators<br>Household survey according to established protocols |
| | Modal share of public transportation | impact | % | DDW inhabitants | 10 years | Trips made in PT modes divided by the total number of trips | Household survey according to established protocols |
| | Average mobility expenses | impact | ETB | DDW inhabitants | 10 years | Average household expense on transport | Household survey according to established protocols |
| | GHG emissions per year per inhabitant | impact | CO2 eq per year per inhab. | DDW | 10 years | Total over transport modes of annual veh.km per mode multiplied by the emission factor per mode | For TP modes: operator data<br>For private modes: counts, calculation after household survey processing. |
| | Air pollution | impact | ton | DDW | 5 years | Total over transport modes of annual veh.km per mode multiplied by the emission factor per mode and per pollutant (NOx, PM10, PM2,5, COV, SO2, benzene) | Depends on period:<br>- Yearly : By odometer measures<br>- 5 years : Household survey + reduced surveys)<br>- 10 years : Household surveys |
| | Lower emission fuel norm implemented | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Implementation of a Norm/Law about lower emission fuel |
| | Number of low energy vehicles purchased | output | vehicles | DDW | Yearly | Number of low energy vehicles purchased by year | Transport Authority / City of Dire-Dawa reporting |
| | Share of green vehicles (technical control validated) | outcome | % | DDW | Yearly | Number of green vehicles (validated by a technical control) divided by total number of vehicles | Transport Authority / City of Dire-Dawa reporting |
| | fuel quality | outcome | ppm or mg/L | DDW | 5 years | Fuel quality is determined by the concentration (in ppm) of sulphur (or even benzene, butane, isoprene and manganese). | Sampling and polarographic process on acetate electrolyte with toluene/methanol |
| | % planned CAPEX disbursed | outcome | % | DDW | Yearly | CAPEX consumed / CAPEX planned at plan level by programming | Mobility Committee (budget) annual report |
| | Extra cost generated | outcome | ETB | DDW | Yearly | Extra cost generated per action | Mobility Committee annual report |
| | Existence of fare integration | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of fare integration |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **7. Integrate transport and mobility strategies and actions** | Amount of investements followed up | outcome | ETB | DDW | Yearly | Total amount of investements for SUMP projects followed up | Mobility Committee annual report |
| | Annual CAPEX per objective/action | output | MUSD | DDW | 5 years | Total annualised investments per objective/action | Mobility Committee budget annual report |
| | %CAPEX used compared to %completion | output | ratio | DDW | 5 years | (CAPEX used / estimated CAPEX) divided by progress status | Mobility Committee budget annual report |
| | Annual OPEX per PT line/project | output | MUSD | DDW | 5 years | Annual operation cost per PT line | PT Operators annual budget report |
| | Generated incomes | output | MUSD | DDW | 5 years | Total revenues generated by PT lines | PT Operators annual budget report |
| | Budgetary drift per year/project | output | ETB | DDW | Yearly | Cumulative budget deficit (total disbursed - total planned) | Mobility Committee (budget) annual report |
| | Coverage ratio for the PT network | outcome | ratio | DDW | 5 years | PT generated incomes / (CAPEX + OPEX for PT network) | Mobility Committee budget annual report |
| | Annual subsidy | outcome | ETB | DDW | Yearly | Annual subsidy from the City of Dire-Dawa to cover PT OPEX | City of Dire Dawa (budget) annual report |
| | CAPEX contribution per funding sources | outcome | funding sources | DDW | 5 years | Total annual investment per stakeholder | Annual stakeholder budget reports |
| | Economic internal rate of return for PT projects | outcome | % | DDW | 5 years | 0 = sum over n years [(annual project social benefits + annual project revenues - annual project capex - annual project opex) / (1 + IRR)^n ] | Annual stakeholders results reports |
| | Financial internal rate of return for PT projects | outcome | % | DDW | 5 years | 0 = sum over n years [( annual project revenues - annual project capex - annual project opex) / (1 + IRR)^n ] | Annual stakeholders results reports |
| | Net actualized value for PT projects | outcome | MUSD | DDW | 5 years | Sum over n years [( annual project benefits - annual project capex - annual project opex) / (1 + IRR)^n ] | Mobility Committee budget annual report |
| | % funded projects per objective/time horizon, | impact | % | DDW | Time horizon | Number of funded projects divided by total number of projects | Mobility Committee budget annual report |
| | Revenues of transportation hubs (if relevant) | outcome | ETB | DDW | Yearly | Total revenues | Annual operator reports |
| | Socioeconomic internal rate of return of mobility projects | impact | % | DDW | Yearly | 0 = sum over n years [(annual project social benefits + annual project revenues - annual project capex - annual project opex) / (1 + IRR)^n ] | Annual stakeholders results reports |
| | Investment efficiency - all computed by PT line | impact | ETB/(pax.km) | DDW | Yearly | Yearly CAPEX divided by yearly patronage multiplied by run kilometres | Mobility Committee (budget) annual report<br>Operators report |
| | CAPEX data processing tools to be aquired | output | MUSD | DDW | Yearly | total investment on data management tools | Mobility Committee (budget) annual report |
| | Congestion rate | impact | % | DDW road network | 5 years | Maximum peak hour traffic flow divided by the nominal capacity of the road axis. Estimation of capacity from known values according to number of lanes. | Traffic counts |
| | Availability of multimodal information | output | % | DDW | 5 years | Stations equipped with a multimodal information system divided by total stations-multimodal hubs | Field visits |
| | Number of technical controls carried out each year | output | technical controls | DDW | Yearly | Total number of technical controls carried out each year (per operator) | Paratransit operators maintenance reports |
| | Number of professionals part of the planning team | output | professionals | DDW | Yearly | Number of professionals part of the planning team | Mobility Committee (human ressources) annual report |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **7. Integrate transport and mobility strategies and actions** | Thematic assessment of the team (rating) | output | score | DDW | 5 years | Scale of 1 to 5 per thematic (transport planning, modelling, project management, economics):<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent | Interview and evaluations of the team |
| | % data set available | output | % | DDW | Yearly | Number of available data divided by total data listed in dataset | Stakeholders (data management department) reports |
| | % data set computable | output | % | DDW | Yearly | Number of computable data divided by total data listed in dataset | Stakeholders (data management department) reports |
| | % stakeholders engaged through a formal agreement | output | % | DDW | Yearly | Number of agreements done per year divided by total stakeholders | Transport Authority (data management) annual report |
| | Number of dedicated personnel among the Transport Authority | output | persons | DDW | Yearly | Number of dedicated personnel among the Transport Authority | Transport Authority (human ressources) annual report |
| | Setting of a Mobility Committee | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of a Mobility Committee |
| | Setting of a Transport Authority | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of a Transport Authority |
| | Setting of a SUMP Taskforce | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of a SUMP Taskforce |
| | Number of staff involved in SUMP project follow up and implementation | outcome | persons | DDW | Yearly | Number of people involved in SUMP projects | SUMP Evaluation, Mobility Committee organization |
| | Number of contracts with operators | outcome | contracts | DDW | Yearly | Number of contracts with operators | Mobility Committee organization |
| | Number of trainings for SUMP staff | output | trainings | DDW SUMP Staff | Yearly | Number of trainings for SUMP staff per year and per theme: mobility, social inclusion, gender approach, environnement | Mobility Committee SUMP team reporting |
| | Number of training hours for SUMP staff | output | hours | DDW SUMP Staff | Yearly | Number of training hours for SUMP staff per year and per theme: mobility, social inclusion, gender approach, environnement | Mobility Committee SUMP team reporting |
| | Number of tools for SUMP staff | output | tools | DDW SUMP Staff | Yearly | Number of tools (methodologies, processes, guidelines, etc.) available for SUMP staff per year and per theme: mobility, social inclusion, gender approach, environnement | Mobility Committee SUMP team reporting |
| | Number of trained personnel for SUMP staff | output | persons | DDW SUMP Staff | Yearly | Number of trained personnel for SUMP staff per year and per theme: mobility, social inclusion, gender approach, environnement | Mobility Committee SUMP team reporting |
| | Number of partnerships for SUMP staff | output | partnership | DDW SUMP Staff | Yearly | Number of partnerships for SUMP staff per year and per theme: mobility, social inclusion, gender approach, environnement | Mobility Committee SUMP team reporting |
| | Number of study tours for SUMP staff | output | study tours | DDW SUMP Staff | Yearly | Number of study tours, exchanges for SUMP staff per year and per theme: mobility, social inclusion, gender approach, environment | Mobility Committee SUMP team reporting |
| | Transversal mobility approach in transport project | outcome | % | DDW | Yearly | Average of number of pages dedicated to tranversal mobility approach divided by total number of pages of deliverables | Mobility Committee SUMP team reporting |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **7. Integrate transport and mobility strategies and actions** | Share of studies/projects planned that are undertaken on a given time period (or progress rate of SUMP planning tasks) | outcome | % | DDW | 5 years | Number of actions committed / total number of actions in a time period | Mobility Committee annual report |
| | Progress rate of mobility projects according to the project cycle defined into the project management framework | outcome | % | DDW | 5 years | Progress rate of projects which is calculated on the basis of a project cycle | Mobility Committee annual report |
| | % SUMP actions evaluated (among implemented ones) | outcome | % | DDW | Yearly | Number of evaluated SUMP actions divided by implemented SUMP actions | Mobility Committee annual report |
| | Number of publication per year | outcome | publications | DDW | Yearly | Number of publication per year | Mobility Committee annual report |
| | Number of references/studies relying on the data model established | impact | studies | DDW | Yearly | Number of references/studies relying on the data model established | Mobility Committee (Data Management Department) annual report<br>If OpenSource data: number of dataset download for academic/research purposes |
| | Number of adjustments/update integrated into the SUMP | outcome | adjustements | DDW | Yearly | Number of adjustments/update integrated into the SUMP | Mobility Committee annual report |
| | Progress status per actions | outcome | % | DDW | Yearly | Qualitative percentage of progress status per actions | Mobility Committee annual report |
| | Progress status of the SUMP (% SUMP actions fully implemented) | outcome | % | DDW | Yearly | Number of actions fullt implemented divided by total SUMP actions | Mobility Committee annual report |
| | % of the target objectives fully met at action/SUMP level | outcome | % | DDW | Yearly | Number of target objectives with all their actions fully implemented divided by total number of SUMP target objectives | Mobility Committee annual report |
| | Additional delays reported | outcome | months, years | DDW | Yearly | Additional months or years reported per action | Mobility Committee annual report |
| | Number/share of flagged actions covered with corrective actions | outcome | % | DDW | Yearly | Number of flagged actions covered with corrective actions (share: divided by total SUMP actions) | Mobility Committee annual report |
| | Number of SUMP projects followed up | outcome | SUMP projects | DDW | Yearly | Number of SUMP projects followed up | Mobility Committee annual report |
| | Number of demand management measures taken | output | measures | DDW | 5 years | Number of demand management measures taken | Transport Authority annual reporting |
| | Compliancy to multimodality strategy (rating) | output | score | DDW | 5 years | Scale of 1 to 5 of intermodal quality:<br>0 - 2: Very Poor<br>2 - 3,5: Poor<br>3,5 - 4,5: Good<br>4,5 - 5: Excellent | Mobility Committee report |
| | BRT perception from the user perspective | impact | score | DDW inhabitants | 5 years | Scale of 1 to 5 (1 = very dissatisfied, 5 = very satisfied) | User perception/satisfaction survey |
| | Number of projects per social thematic | outcome | projects | DDW | Yearly | Number of implemented projects per social thematic (gender approach, social inclusion, environmental) | Mobility Committee reporting |
| | Number of actions per social thematic | outcome | actions | DDW | Yearly | Number of planned actions per social thematic (gender approach, social inclusion) | Mobility Committee SUMP team reporting |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| **7. Integrate transport and mobility strategies and actions** | Number of awareness raising events | output | events | DDW | Yearly | Number of awareness raising events carried out each year | Mobility Committee SUMP team reporting |
| | Number of people reached through events | output | persons | DDW | Yearly | Total number of people reached through events each year | Mobility Committee SUMP team reporting |
| | Percentage of projects discussed / presented in awareness raising events per social thematic | outcome | projects | DDW | Yearly | Number of implemented projects discussed / presented in awareness raising events divided by total number of implemented projects per social thematic (gender approach, social inclusion) | Mobility Committee reporting |
| | Percentage of actions discussed / presented in awareness raising events per social thematic | outcome | actions | DDW | Yearly | Number of planned actions discussed / presented in awareness raising events divided by the number of total planned actions per social thematic (gender approach, social inclusion) | Mobility Committee SUMP team reporting |
| | Mobility rate per type of public, including women, elders, person with reduced mobility, person with limited resources | impact | ratio | DDW inhabitants | 10 years | Average of number of daily trips made by one person per type of public | Household survey according to established protocols |
| | Number of transport hubs implemented | output | transport hubs | DDW transport network | 5 years | Number of transport hubs implemented | Transport Authority annual report |
| | Urban renewal around the hub | impact | ratio | DDW | 5 years | Number or surface area of cadastral operations in a 500m perimeter from the hub, standardised at city level | Georeferenced local authority demographic data and hub locations in GIS format. |
| | Increase in the value of land | impact | ratio | DDW | 5 years | Average land value ($m^2$) around the 500m perimeter, divided by average land value at city level | Georeferenced local authority demographic data and hub locations in GIS format. |

| OBJECTIVE | INDICATOR | TYPE | UNIT | PERIMETER | PERIOD | PRODUCTION | COLLECTION |
|---|---|---|---|---|---|---|---|
| 8. Integrate sustainable mobility with urban and economic development | Average travel time per trip | impact | minutes | DDW inhabitants | 10 years | Calculation of average travel time per trip. Understood as the average of the travel time of all trips. | Household survey according to established protocols |
| | Noise pollution | impact | dB | DDW | 5 years | Noise measurements in specific points with special instrumentation | Noise measurements in specific points with special instrumentation |
| | TOD Development Plan | output | boolean | DDW | 5 years | 1 - True<br>0 - False | Existence of TOD Development Plan |
| | Revision of TOD Development Plan | output | boolean | DDW | 5 years | 1 - True<br>0 - False | Revision of TOD Development Plan |
| | Appraisal of TOD Development Plan | output | boolean | DDW | 5 years | 1 - True<br>0 - False | Appraisal of TOD Development Plan |
| | TOD support actions | outcome | actions | DDW | Yearly | Number of TOD support actions | Transport authority production |
| | Coordination of TOD projects | outcome | operations | DDW | Yearly | Number of operations with a TOD approach | Transport authority production |
| | TOD projects | impact | projects | DDW | Yearly | Number of TOD projects to be implemented | Transport authority production |
| | TOD projects in TOD focus areas | output | projects | DDW | Yearly | Number of TOD projects to be implemented in TOD focus areas | Transport authority production |
| | Urban density around BRT stations | outcome | inhabitants/ha | DDW | 5 years | Calculation by GIS processing of the volume of inhabitants present in the area of influence of BRT stations, considering a radius of 500 m (pro rata of the surface area). | Georeferenced local authority demographic data and BRT station locations in GIS format. |
| | Mix of activities around BRT stations | outcome | index | stations | 5 years | Qualitative index based on the mix of land uses around BRT stations (500m perimeter):<br>Level 1 - Only residential<br>Level 2 - Resid./Commercial<br>Level 3 - Resid/Comm/Profes | Georeferenced local authority demographic data and BRT station locations in GIS format. |
| | Patronage of BRT stations | outcome | pax/day | stations | 5 years | Daily passenger volume count at each BRT station | Counts or validation data from BRT operator |
| | TOD new guidelines | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Existence of TOD Guidelines |
| | TOD revised guidelines | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Revision of TOD Guidelines |
| | TOD updated guidelines | output | boolean | DDW | Yearly | 1 - True<br>0 - False | Appraisal of TOD Guidelines |

## 7.8. Glossary

| | |
|---|---|
| **AFD** | Agence Française de Développement (French Agency for Development) |
| **BAU** | Business-as-Usual |
| **BRT** | Bus Rapid Transit |
| **CBA** | Cost Benefit Analysis |
| **CH4** | Methane |
| **CO2** | Carbon dioxide |
| **CO2e** | Carbon dioxide equivalent |
| **GDP** | Gross Domestic Product |
| **GHG** | Greenhouse Gas |
| **LRT** | Light Rail Transit |
| **MaaS** | Mobility-as-a-Service |
| **MRV** | Monitoring, Reporting and Verification |
| **MYC** | MobiliseYourCity Partnership |
| **NOx** | Nitrogen Oxides |
| **N2O** | Nitrous Oxide |
| **NUMP** | National Urban Mobility Policy and Investment Programme |
| **PKM** | Passenger Kilometres Travelled |
| **PM** | Particulate Matter |
| **PPP** | Public Private Partnership |
| **PT** | Public Transport |
| **SUMP** | Sustainable Urban Mobility Plan |
| **TKM** | Total Kilometres Travel |
| **VKT** | Vehicles Kilometres Travelled |