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Deliverable 3: Cost Benefit Analysis

Technical studies for the improvement of the transport logistics in Dr. Jules Sedney Terminal

April 2019

Content

1. Introduction

Dr. Jules Sedney Terminal, the Port of Paramaribo is located about 34 km from the estuary of the Suriname River. The port is Suriname's main cargo gateway, accounting for approximately 90% of the total seaborne trade (excluding oil and alumina). The port is run by NV Havenbeheer Suriname[1] (hereinafter HBS), who acts as a landlord, responsible for its daily management operations and its long-term development; meanwhile, the cargo handling is responsibility of two private stevedoring companies, VSH Transport and DP World Paramaribo.

The port handled just over 100,000 TEU in 2016 and slightly more than 80,000 TEU in 2017. Additionally, 200,000 tons of breakbulk cargo and 160,000 tons of liquid bulk are handled in the port, which account for a daily traffic of over 250 heavy vehicles that are coming in and outside the port.

The agricultural, fishing and forestry sectors make up 38% of the volume of foreign trade and 8% of the total value, according to 2017 customs data. The Dr. Jules Sedney Terminal is the exit point for more than 80% of the rice exports and more than 95% for bananas, shrimp and fish exports. Also, the importance of this port lies in the fact that supplies and equipment for crops arrive to the country by sea. In recent years, imports and exports of the agricultural sector have been affected by increasing freight costs and transit times due to limitation in the roads that connect the producing areas to the port, as well as operational difficulties in the port access.

As the main entry and departure point for international trade in Suriname, access to Dr. Jules Sedney Terminal is vital for the economic development of many industries. In this regard, transport companies are one of the most important stakeholders as it allows products form Surinamese agricultural, fishing and forestry industries to send their products abroad and import necessary supplies and equipment. Currently, the access roads to the port are presenting congestions that is making the trade operations inefficient.

Van 't Hogerhuysstraat, the main road to the Dr. Jules Sedney Terminal, has a traffic of more than 50,000 vehicles per day. This traffic includes the trucks heading towards the port, which has deteriorated the road, road shoulders and parapets. Also, the drainage along the road has proven inadequate for current rainfall levels of Paramaribo, failing to prevent flooding that worsens the traffic. This road represents a major bottleneck for trucks going in and out of the port, increasing the cost of agriculture exports and manufactured products imports.

The high congestion within the road, has limited the competitiveness of transportation due to the difficulties in its access. As a temporary solution to the Van 't Hogerhuysstraat congestion issue, NV Havenbeheer Suriname had to made adjustments in the port, reducing its capacity and competitiveness. This includes the closure of the main truck gate, the use of a 470 m internal road for truck traffic, and the temporary use of a storage area of 12,914 m^2 for transit and parking. This has been due to the lack of schedule planning for transportation and the limited access capacity.

Furthermore, NV Havenbeheer has recently made physical and administrative improvements, having implemented new port management and information systems that improved access control to the port, and enabled the company with better statistical information. However, these improvements are still in development and there are several investments regarding equipment, IT development, and stakeholder's training that has to be done in order to fully automate the port access.

The Inter-American Development Bank (IDB) is promoting an improvement initiative to help Suriname's transport in the Port of Paramaribo and its adjacent roads. The Improvement of Logistic and Transport in Paramaribo Program aims to increase Suriname's competitiveness and productivity in the agricultural sector by improving the transport logistics within and near the Dr. Jules Sedney Terminal. The program considers investments and activities throughout four inter-related fronts:

a) Improvement of port access and land utilization;
b) Optimization of port operation and customs inspections;
c) Upgrade and climate adaptation of road infrastructure, bridges and secondary roads; and
d) Modernization of traffic management.

To determine the scope of these components, the IDB has created a Technical Cooperation that seeks to prepare the key technical analysis for the design of the program, as well as to help identify strategic interventions that will help to fulfill the objectives.

Some of the main problems identified in the operation of the port, that will be considered by the Technical Collaboration include the following:

[1]Created in 1971, NV Havenbeheer Suriname is an autonomous, state-owned limited liability company in charge of the administration of the two main ports of the country, the Port of Paramaribo and the Port of Nieuw Nickerie.

- The current dwell time for the trucks within the Dr. Jules Sedney Terminal can be up to 5 hours as the trucks arrive before the cargo is cleared by Customs and the terminal operator.
- Lack of scheduling for transportation and limitation by the customs´ schedule, which generate high peaks in the operation, having a 100% container inspection instead of risk analysis assessment based on IT to determine what containers should be inspected.
- Lack of scanning equipment for the inspection of containers.
- Lack of a permanent regulated parking space for trucks, causing truck lines as they wait to be granted for access to the port.
- Lack of spaces to perform value added services to the foreign trade cargo.
- Lack of commercial spaces for the allocation of transport and logistic companies: custom broker agencies, shipping line's offices, logistic operators, etc.

The improvements and future capacity of the road infrastructure have to be aligned with the Dr. Jules Sedney Terminal's Development Plan in order to guarantee that the efficiency and sustainability of the transport and logistic operations.

In order to solve this several interventions in the port and road infrastructure have been determined.

The purpose of this document is to analyze the feasibility from a socioeconomic view, including the estimation of benefits obtained by the project and the CAPEX required for the interventions.

2. Cost Benefit Analysis

In this chapter we have analyzed the feasibility from a financial and socioeconomic viewpoint, for the proposed interventions determined in the design phase by performing a Cost-Benefit Analysis.

Summary of interventions proposed over the road system and port

1) Road interventions

- **A. Capacity expansion** of Martin Luther King and Van 't Hogerhuysstraat
- **B. Repaving and improvement** of other corridors
- **C. Construction of Bridge** over Saramacca Channel
- D. Implementation and synchronization of **Traffic lights** and **Traffic Control Center**

2) Port interventions

- **E. Truck center** outside the port
- F. Implementation of a **Port Community System**

3) Institutional strengthening

Source: Google Earth | Transconsult

The cost benefit analysis was executed based on our findings, the gathered data and information, interviews, and a defined methodology.

2.1. Methodology

The elaboration of the cost benefit analysis is based in the **Manual for the Economic Evaluation of Transport Projects from the IDB.** This manual is used to determine if the project is "good" under a social-economic perspective.

This methodology includes the analysis of the costs and benefits results of two scenarios: i) With interventions and ii) Without Interventions.

The estimation of the benefits of the project was done throughout the estimation of the reduction of the Generalized Travel Costs due to the implementation of the project. To achieve this, we have compared the results between both scenarios. The Generalized Travel Costs was estimated based in the following frameworks:

- **Value of time in economic evaluation of transport projects** published by the World Bank, written by Kenneth M. Gwilliam. This model was further developed by the Mexican Transport Institute to propose a time valuing estimation based on the working time spent on transport and the leisure time spent on transport. This re-revised method takes into account the minim wage, the number of average working hours in a week by employed citizens and an adjustment factor based on the times the minimum wage is earned by a vehicle type occupant.
- **Vehicle Operative Costs** based on parameters of fuel consumption by vehicle type per average speed and non-fuel related costs by vehicle type per kilometer. These inputs were obtained from the California Life-Cycle Benefit/Cost Analysis Model for the 2018 BUILD Applications.

The proposed interventions don't involve a tariff scheme or an additional charge for current and future users which limits the analysis on a socioeconomic perspective. This project doesn't consider benefits for private parties, only social benefits that will yield a social NPV and a social IRR. Port benefits are included for the trucks that use the corridor analyzed, but no internal port activity benefits are considered.

Furthermore, we have developed a sensibility analysis in order to assess the impact of the main uncertainties of the project.

- **Benefits:** The benefits of the project have been calculated throughout a reduction of the cost of the users, which relies in the reduction of time spent and the cost of the vehicle (COV). This variable has been mitigated with the use of microsimulation models that allows us to have a greater degree of certainty about the impact of the project. Furthermore, we have analyzed the benefits of the project by modifying the impact of the interventions in a scenario of -10% and -30%.
- **CAPEX:** Cost of materials and associated works to move current infrastructure. Even though different blueprints were analyzed (i.e. water pipelines and sewerage, telephone lines, fiber optics, and high and low tension cables), the detail wasn't enough to fully comprehend the magnitude of the needed works to implement all interventions. In the case of the costs, Suriname relies heavily in the import of some construction materials that could impact the overall costs. In order to reduce this risk, we have analyzed the feasibility of the project in a scenario with an increase of 10% and 30% in the CAPEX.

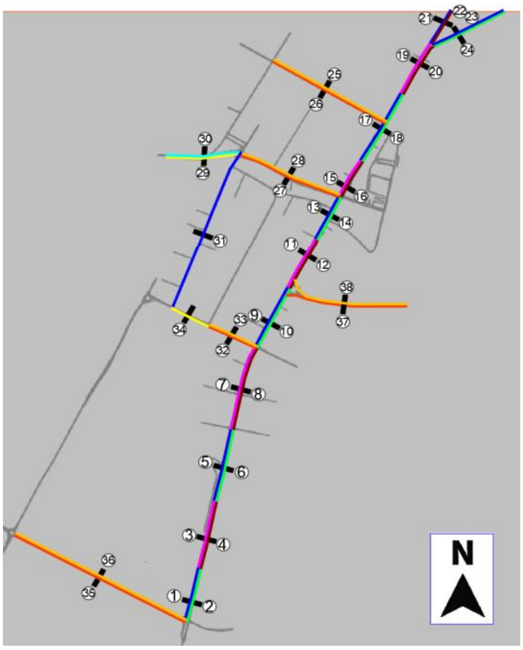
The timeframe used for the evaluation of this project was 20 years.

2.2. Scenario without a project

The scenario without a project consists on the current situation of the access roads to the port, and the traffic conditions that resulted from the microsimulation. The microsimulation used all the data gathered during the Technical Visit and the drone flights (e.g. traffic counts per directions, turns, average speed, vehicle type) as inputs to model the current situation. As mentioned before, in the Methodology, the main costs that are being quantified are the **Value of Travel Time and the Vehicle Operating Costs under the current conditions.**

2.2.1. Value of Travel Time

The first cost analyzed is the value of time in economic evaluation of transport projects. To estimate these costs, it was necessary to first characterize the traffic conditions of the road network in the 38 designed sections:



Sections analyzed for the road network

Road	Northbound	Southbound	Length (km)
Martin Luther Kingweg	1	2	0.050
Martin Luther Kingweg	3	4	0.500
Martin Luther Kingweg	5	6	0.500
Martin Luther Kingweg	7	8	0.520
Van 't Hogerhuysstraat	9	10	0.500
Van 't Hogerhuysstraat	11	12	0.500
Van 't Hogerhuysstraat	13	14	0.350
Van 't Hogerhuysstraat	15	16	0.250
Van 't Hogerhuysstraat	17	18	0.500
Zwartenhovenbrugstraat	19	20	0.580
Zwartenhovenbrugstraat	21	22	0.562
Saramaccastraat	23	24	0.644
Hernhutterstraat	-	31	1.080

Road	Eastbound	Westbound	Length (km)
Molenpad	25	26	0.825
Willem Campagnestraat	28	27	0.707
Willem Campagnestraat	30	29	0.462
Slangenhoutstraat	33	32	0.330
Slangenhoutstraat		34	0.255
Latourweg	36	35	1.247
Jules Wijdenboschbrug	38	37	0.518

Each of the sections was analyzed in the current state microsimulation to obtain the average traffic in the peak hour, the vehicle composition, and the average speed in each section. Full results in ***Table A. Average speed and traffic by segment and vehicle composition in*** **peak hour *(2018)***.

According to these, we have estimated the average travel time for each of the sections in 2018, as well as the total travel time in peak hour for all of the vehicle types, as shown in the next table:

Road	ID	Average travel time peak hour (hr)	Cars (hr)	Public transport (hr)	Trucks (hr)	Motorcycle (hr)
Martin Luther Kingweg	1	0.001	1.3	0.1	0.1	0.1
	2	0.012	12.7	0.6	0.4	1.3
	3	0.012	12.1	1.0	0.1	2.1
	4	0.013	17.1	1.4	0.2	3.0
	5	0.012	12.7	1.0	0.1	2.3
	6	0.029	29.9	2.8	0.2	5.7
	7	0.040	37.5	3.5	0.3	7.2
	8	0.007	5.8	0.6	0.1	1.2
Van ‘t Hogerhuysstraat	9	0.019	9.1	0.9	0.1	1.9
	10	0.015	9.4	2.7	0.1	3.0
	11	0.014	7.9	2.2	0.1	2.5
	12	0.032	9.6	2.6	0.5	1.3
	13	0.001	0.9	0.1	0.0	0.1
	14	0.012	8.6	0.6	0.3	0.7
	15	0.012	7.8	0.9	0.1	1.2
	16	0.016	10.8	1.2	0.2	1.7
	17	0.012	10.6	1.2	0.2	1.7
	18	0.012	13.3	1.4	0.5	1.5
Zwartenhovenbrugstraat	19	0.008	10.0	1.0	0.4	1.2
	20	0.012	11.7	1.3	0.4	1.5
	21	0.012	11.8	1.3	0.4	1.5
	22	0.015	13.5	3.1	0.3	2.3
Saramaccastraat	23	0.024	15.4	3.6	0.4	2.6
	24	0.039	8.7	0.7	0.2	7.5
Molenpad	25	0.019	2.2	0.2	0.1	0.3
	26	0.020	5.4	0.1	0.1	1.0
Willem Campagnestraat	27	0.017	9.1	-	0.2	2.4
	28	0.018	12.9	0.2	1.6	0.8
	29	0.011	13.9	-	0.2	3.7
	30	0.013	10.5	0.2	1.3	0.6
Hernhutterstraat	31	0.068	96.8	1.5	3.3	11.6
Slangenhoutstraat	32	0.008	6.5	0.1	0.3	0.5
	33	0.008	1.2	0.1	0.1	0.1
	34	0.006	9.1	0.1	0.4	0.7
Latourweg	35	0.031	21.9	0.3	2.7	1.3
	36	0.032	19.8	-	0.3	5.2
Jules Wijdenboschbrug	37	0.098	37.0	0.5	0.4	19.2
	38	0.013	9.1	0.2	0.6	1.7
TOTAL			**543.6**	**39.3**	**17.2**	**104.2**

Once the travel times have been quantified, we have estimated its value based on the labor characteristics in Suriname. Each vehicle type time value was estimated using the following information[2]:

[2]Labor information based on Suriname profile of the International Labor Organization

World Bank methodology to estimate work and leisure time value

$$Work\ time\ value\ (WTV) = \frac{IAF * MW * WD}{WAWH} = \frac{IAF * \$6.59\frac{USD}{day} * 7\ days}{48\ hours} = \mathbf{IAF * 0.96}\frac{\mathbf{USD}}{\mathbf{hour}}$$

$$Leisure\ time\ value\ (LTV) = \frac{0.3 * N * IAF * MW}{WAWHL} = \frac{0.3 * 2 * FIP * \$6.59\frac{USD}{day}}{6.86\ hours} = \mathbf{IAF * 0.58}\frac{\mathbf{USD}}{\mathbf{hour}}$$

IAF: Income adjustment factor
MW: Minimum wage per day in Suriname
WD: Weekdays
WAWH: Weekly average working hours in Suriname
0.3: Fraction of household income based on World Bank empirical data
N: Number of members of a household perceiving an income
WAWHL: Weekly average working hours per day

The income adjustment factor (IAF) was obtained based in available salary wages information for 100 different job positions in Paramaribo; this will vary depending on the vehicle type. The Surinamese context was modelled using available data from the International Labor Organization regarding minimum wage, weekly worked hours; and the Central Bank of Suriname exchange rates.

These WTV and LTV were then calculated for each of the vehicle type based on the following assumptions:

- **Income adjustment factor (IAF):** The IAF for the cars was calculated based on the average salary of the 100 benchmark figures for Paramaribo[3], including middle and high management positions; the IAF number is 4.03 times the minimum income. The IAF for the Public Transport and the Motorcycle drivers is 1.54 times the minimum income based on the average salary of the database that without middle and high management positions (57 registers). Finally, the Truck drivers IAF was considered the minimum income, with a value of 1.
- **WTV/LTV ratio:** Cars, Public Transport and Motorcycles where considered to have 5 weekdays for work (71%) and the 2 remaining for leisure (29%). The Trucks were considered to have only work travel time (100%).
- **Number of passengers:** The number of passengers of Cars was considered 1.4[4]. Trucks and Motorcycles were considered to have 1 passenger based on the regular use seen in other cities and port accesses. Finally, de Public Transport passenger number of 17 was calculated based on a study made by the Ministry of Works of Suriname[5].

The value of travel time per hour for each vehicle type is:

Total value of travel time per vehicle type in the corridor

Transport type				
Income adjustment factor (IAF)	4.03	1.54	1.00	1.54
Work time value (WTV)	$3.88 USD/hr	$1.48 USD/hr	$0.96 USD/hr	$3.88 USD/hr
Leisure time value (LTV)	$2.33 USD/hr	$0.89 USD/hr	$0.58 USD/hr	$0.89 USD/hr
WTV/LTV Ratio	71%/29%	71%/29%	100%/0%	71%/29%
Value of travel Time (VTT)	$3.43 USD/hr	$1.31 USD/hr	$0.96 USD/hr	$1.31 USD/hr
# of passengers	1.4	17	1.0	1.0
Total VTT	**$4.81 USD/hr**	**$22.24 USD/hr**	**$0.96 USD/hr**	**$1.31 USD/hr**

Value of Travel Time at peak hours (current scenario, 2018)

	Cars	Public Transport	Trucks	Motorcycle	Total
Average travel time peak hour	543.6 hr	39.3 hr	17.2 hr	104.2 hr	
Total value of travel time	$4.81 USD/hr	$22.24 USD/hr	$0.96 USD/hr	$1.31 USD/hr	
Total value of travel time at peak hour	$2,612	$874	$17	$136	**$3,639**

[3] Numbeo and salary surveys

[4] Based on an IDB study analyzing the traffic conditions of the Historical Center of Paramaribo; due to its proximity with the analyzed read network, the same number was considered.

[5] The study included the public transport composition per passenger number capacity in the roads near the Saramacca Channel between Martin Luther Kingweg and Van 't Hogerhuysstraat

The current total value of travel time for the road network analyzed in peak hour is **$3,639 USD**. This amount is made up by the total time spent by each vehicle type within the road network in a peak hour; each vehicle type will have a specific time value based on the average income of its passengers, its work/leisure ratio, and the average number of passengers.

The value of travel time makes only one of the components of the generalized costs of the network concerning the vehicle transit.

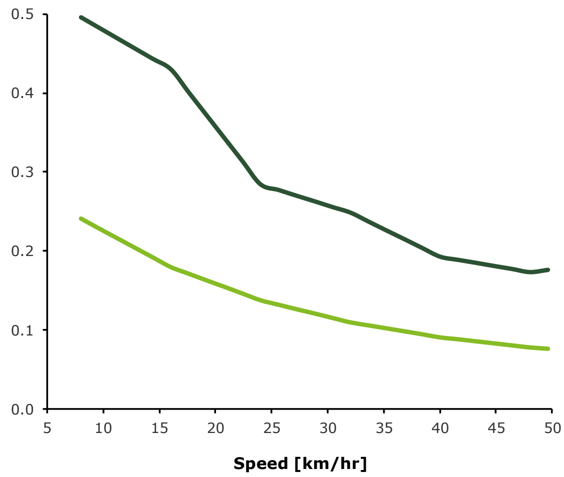
2.2.2. Vehicle Operating Costs (VOC)

The second component analyzed is the Vehicle Operating Costs (VOC) which is made up from two main sources: i) fuel related costs and ii) non-fuel related costs. To calculate the VOC, the California Life-Cycle Benefit/Cost Analysis Model for 2018 (Cal-B/C Model) was used for its parameters on fuel consumption and non-fuel costs.

Vehicle fuel related costs

The fuel related costs of the network can be obtained based on each of the sections average speed. The Cal-B/C model uses fuel consumption efficiency tables based on the speed for automobiles, including motorcycles, and trucks. These data were graphed with the speed in the x axis and the fuel consumption on the y axis to obtain two different curves, one for the automobile and the other for the trucks. Each of the graphs was subjected to a polynomic regression (second degree) to obtain the equations to calculate the fuel consumption at any given speed. The results of this exercise is shown up next:

Fuel consumption by speed
Lt/hr, personal vehicles and trucks



Vehicle type	Equation	R^2
Personal vehicle	$y=2E\text{-}4x^2-0.0189x+0.6584$	0.9880
Trucks	$y=9E\text{-}5x^2-0.0089x+0.3031$	0.9981

It is observed that both R^2 values are near to 1 with 0.9880 for automobiles and 0.9981 for trucks. This means the polynomic regression adequately explains the data set behavior and can be used to calculate the fuel consumption at any given speed.

Using the regression equations and the length of each of the 38 sections, the current gas consumption per vehicle time at peak hour was calculated for trucks and private vehicles (See full detail in *Table B. Gas consumption by type of transport and section (Without Interventions)*).

The auto fuel consumption for the corridor will apply to the private cars and the motorcycles, while the truck fuel consumption to the transport trucks and public transport. These amounts can be multiplied by the number of vehicles that transit the network during peak hour to calculate the total liters being consumed under the current situation (See full detail in *Table C. Gas consumption by modal split and section (without interventions)*).

The liter consumption was estimated using the retail prices in October 2018, for gasoline ($0.93 USD/lt) and diesel ($0.88 USD/lt). However, a 5% and 10% import taxes were removed for gasoline and diesel, respectively, as well as a 10% VAT. The final prices considered were $0.79 USD/lt for gasoline and $0.70 USD/lt for diesel.[6]

The current total fuel consumption for the network accessing Dr. Jules Sedney Terminal in peak hour is:

Fuel consumption in the road network at peak hours (current scenario, 2018)

	Cars	Public Transport	Trucks	Motorcycle	Total
Total fuel consumption per vehicle type	1,711 lt	303 lt	148 lt	312 lt	
Price per liter of fuel	$0.79 USD/lt	$0.70 USD/lt	$0.70 USD/lt	$0.79 USD/lt	
Total value of travel time at peak hour	$1,352	$212	$104	$247	**$1,915**

Vehicle Non-Fuel related costs

Additionally, vehicle non-fuel costs need to be considered. The Cal-B/C Model considers a standardized cost of $0.04 USD/km for automobile type vehicles and $0.06 USD/km for trucks. This considers maintenance & repair costs, oil, tires, and depreciation. The total linear length of the network is 20.43 km, but each one of the section has a defined length and a number of vehicle type transiting. Obtaining each of the sections' non-fuel vehicle costs for each vehicle type yielded the next total results:

Non-Fuel costs in the road network at peak hours (current scenario, 2018)

	Cars	Public Transport	Trucks	Motorcycle	Total
Total length of road network	20.43 km				
Average traffic in peak hour	795	55	26	182	
Price per km	$0.04 USD/km	$0.06 USD/km	$0.06 USD/km	$0.04 USD/km	
Total value of travel time at peak hour	$650	$68	$32	$149	**$899**

2.2.3. Generalized Travel Costs

The current generalized travel costs of the network in peak hour are **$6,453** for the value of travel time, and vehicle operating costs.

2.3. Scenario with project

In this activity we have estimated the Generalized Travel Costs in the scenario with the proposed interventions with the results of the microsimulation. The costs quantified were the Value of Travel Time and the Vehicle Operating Costs under the current conditions, same as in the scenario without interventions. This costs have been compared to the costs of the scenario "Without interventions" to quantify the benefits form these investments.

2.3.1. Value of Travel Time

The interventions were proposed due to the benefits they can cause and the improvements in the road network. The main improvements will be visualized in an increasing speed in the corridor, which will cause an efficiency in fuel consumption as well as faster travel times, meaning less congestion and less time spent in traffic. Given the nature of the interventions, which doesn't involve a concession or the creation of revenue streams, only the social benefits are considered.

[6] For the estimation of costs, cars and motorcycles are considered to use gasoline; and public transport and trucks to use diesel.

To quantify the benefits, the costs of the situation with interventions were calculated using the same methodology as the current situation scenario. The information for the situation with interventions was obtained from the microsimulation of the design phase, as it takes into account the same traffic conditions of vehicle type, but models them in the new proposed environment. The same vehicle type mix is not varied as available information doesn't suggest a significant change in the future.

First, the number of vehicles and average speed in the network was obtained under the proposed circumstances for the peak hour. The same number of vehicles is considered, but due to the improved travel times, the sections' total traffic can vary from the current situation (See full detail in *Table D. Average speed and traffic by segment and vehicle composition in peak hour (With Interventions)*).

In average, the network speed increases from 34.72 km/hr to 38.47 km/hr in 2018 if the interventions were already available. However, this increase can't be applied generally; each of the sections needs to be analyzed to understand the interventions effects with a greater detail level.

Road	ID	Average travel time peak hour (hr)	Cars (hr)	Public transport (hr)	Trucks (hr)	Motorcycle (hr)
Martin Luther Kingweg	1	0.001	1.2	0.1	0.1	0.1
	2	0.012	12.5	0.6	0.7	1.3
	3	0.012	14.0	1.1	0.4	2.5
	4	0.013	16.7	1.4	0.4	2.9
	5	0.012	12.9	1.1	0.1	2.3
	6	0.012	13.6	1.3	0.3	2.6
	7	0.011	12.6	1.2	0.3	2.4
	8	0.006	5.4	0.5	0.1	1.1
Van 't Hogerhuysstraat	9	0.014	8.0	0.8	0.1	1.6
	10	0.018	9.0	2.5	0.1	2.8
	11	0.016	6.3	1.8	0.1	2.0
	12	0.018	4.8	1.3	0.2	0.7
	13	0.002	1.3	0.1	0.1	0.1
	14	0.012	9.7	0.7	0.5	0.8
	15	0.012	9.1	1.0	0.3	1.4
	16	0.013	10.5	1.2	0.4	1.7
	17	0.012	12.7	1.5	0.2	2.0
	18	0.012	14.6	1.5	0.7	1.7
Zwartenhovenbrugstraat	19	0.009	10.1	1.0	0.5	1.2
	20	0.008	8.4	1.0	0.3	1.1
	21	0.013	12.4	1.4	0.4	1.6
	22	0.015	12.1	2.8	0.3	2.1
Saramaccastraat	23	0.016	10.1	2.3	0.2	1.7
	24	0.021	4.6	0.4	0.1	3.9
Molenpad	25	0.028	3.2	0.3	0.1	0.4
	26	0.020	5.3	0.1	0.1	1.0
Willem Campagnestraat	27	0.017	8.0	-	0.1	2.1
	28	0.017	8.3	0.1	1.0	0.5
	29	0.012	14.5	-	0.2	3.9
	30	0.012	8.5	0.1	1.1	0.5
Hernhutterstraat	31	0.027	35.7	0.6	1.2	4.3
Slangenhoutstraat	32	0.008	6.2	0.1	0.3	0.5
	33	0.008	1.4	0.1	0.2	0.1
	34	0.006	6.6	-	0.1	1.8
Latourweg	35	0.032	21.0	0.3	2.6	1.2
	36	0.031	16.4	-	0.3	4.4
Jules Wijdenboschbrug	37	0.013	6.3	0.1	0.1	3.3
	38	0.012	7.6	0.1	0.5	1.4
TOTAL			**381.7**	**30.5**	**14.6**	**66.6**

The same methodology was used to estimate the value of travel time for the peak hour under the intervened conditions. Each vehicle type has a specific time value per hour, with the following results:

Value of Travel Time at peak hours (scenario if proposed interventions where available in 2018)

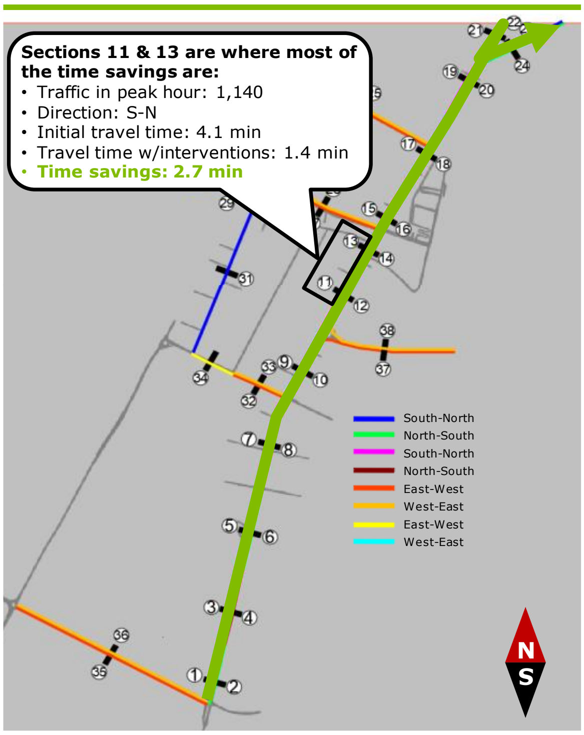
	Cars	Public Transport	Trucks	Motorcycle	Total
Average travel time peak hour	381.7 hr	30.5 hr	14.6 hr	66.6 hr	
Total value of travel time	\$4.81 USD/hr	\$22.24 USD/hr	\$0.96 USD/hr	\$1.31 USD/hr	
Total value of travel time at peak hour	\$1,834	\$678	\$14	\$87	**\$2,614**

Having the total value of travel time costs for the both, the current situation and the situation with interventions, it is possible to calculate the total savings at peak hour in the network.

$$Benefit = Current\ VTT\ at\ peak\ hour - VTT\ at\ peak\ hour\ with\ interventions = \$3{,}639 - \$2{,}614 = \$1{,}025$$

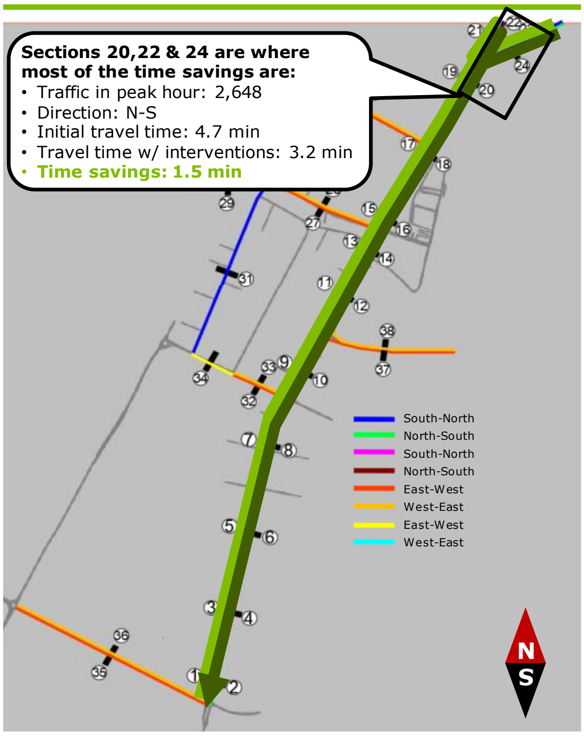
At peak hour, the proposed interventions could save up to **\$1,025 USD** in travel time. The main benefits can be found in specific sections. When grouping the sections in four routes, according to their role in the network, it is easier to find where the main congestions would be relieved.

Analyzed corridor sections and directions



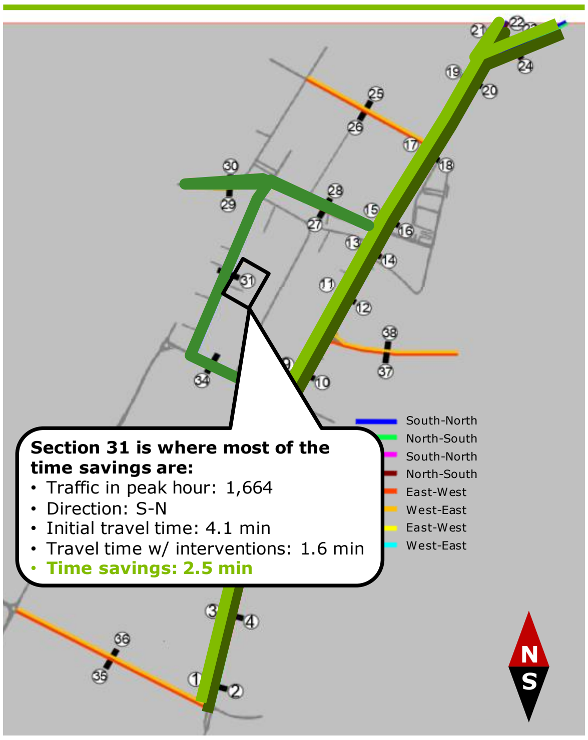
The first considered group is the whole Martin Luther Kingweg and Van 't Hogerhuysstraat corridor, starting from Latourweg in the south to north direction. In this corridor there are 12 sections (i.e. 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23) that would be affected with a 3.6-minute decrease in travel time. The sections 11 and 13 are where the main benefits are with a 2.7-minute saving.

Analyzed corridor sections and directions



The second group is the same corridor but in the opposite direction, from north to south. In this corridor there are again 12 sections (i.e. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24) that would be benefited with a 1.8-minute saving. The sections 20, 22 and 24 are the ones with the main benefits with a 1.5-minute decrease.

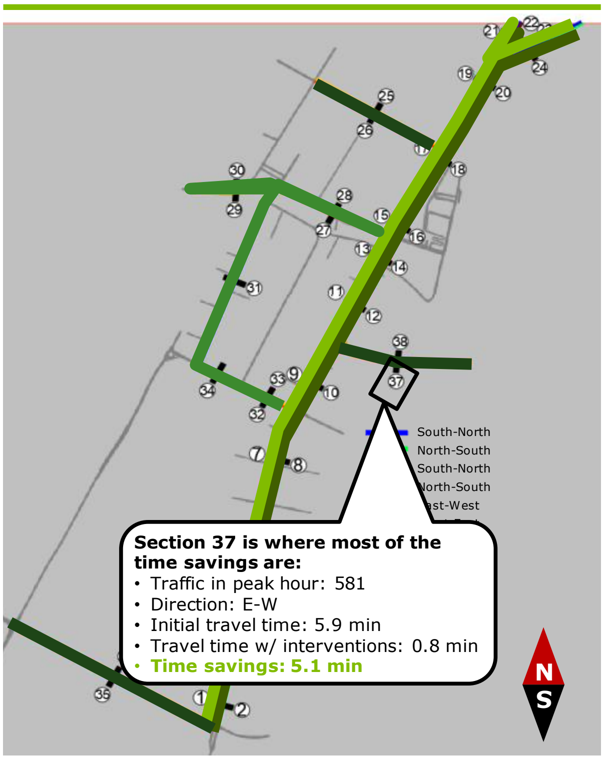
Analyzed corridor sections and directions



The third group is the circuit with Hernhutterstraat, Slangenhoutstraat and Willem Campagnestraat, which serves as an alternative access to the port and, currently, as the only way for southbound trucks to reach

it. This whole corridor, made up by sections 27, 28, 29, 30, 31, 32, 33, and 34 have a 2.6-minute travel time reduction, most of which comes from section 31 in Hernhutterstraat with 2.5 minutes.

Analyzed corridor sections and directions



Finally, the other access roads which are perpendicular to the main corridor have an overall time saving of 4.6 minutes. Sections 25, 26, 35, 36, 37, and 38 are three roads with two directions each (i.e. Latourweg, Jules Wijdenboschbrug, and Molenpad). Jules Wijdenboschbrug has a 5.1-minute reduction time; Molenpad has a 0.5-minute increase which is caused by the traffic order with the street lights.

2.3.1. Vehicle Operating Costs (VOC)

Vehicle Fuel Related Costs

The fuel consumption was also improved due to the better average speeds in the sections (See full detail in *Table E. Gas consumption by type of transport and section (With Interventions)*). With greater speeds, the fuel consumption per kilometer was reduced from the scenario without interventions.

Just as with the current situation estimates, the auto fuel consumption will apply to private cars and motorcycles; truck fuel consumption, to transport trucks and public transport (See full detail in *Table F. Gas consumption by modal split and section (With interventions)*).

The liter consumption was estimated using the retail prices for fuel without taxes, as previously explained, with $0.79 USD/lt for gasoline and $0.70 USD/lt for diesel. The current total fuel consumption for the network accessing Dr. Jules Sedney Terminal in peak hour is:

Fuel consumption in the road network at peak hours (scenario if proposed interventions where available in 2018)

	Cars	Public Transport	Trucks	Motorcycle	Total
Total fuel consumption per vehicle type	1,388 lt	266 lt	130 lt	242 lt	
Price per liter of fuel	$0.79 USD/lt	$0.70 USD/lt	$0.70 USD/lt	$0.79 USD/lt	
Total value of travel time at peak hour	$1,097	$186	$91	$191	**$1,565**

With the total fuel consumption costs for the both scenarios at peak hour, the savings were calculated:

$$\begin{aligned} Benefit &= Current\ fuel\ consumption\ at\ peak\ hour - fuel\ consumption\ at\ peak\ hour\ with\ interventions \\ &= \$1{,}915 - \$1{,}565 = \$350 \end{aligned}$$

At peak hour, the proposed interventions could save up to **$350 USD** in fuel consumption for the users of the network.

Vehicle Non-Fuel Related Costs

The interventions don't necessary provides a distance reduction in the length of the sections, so the non-fuel vehicle costs per kilometer will be the same for the network.

Non-Fuel costs in the road network at peak hours (scenario if proposed interventions where available in 2018)

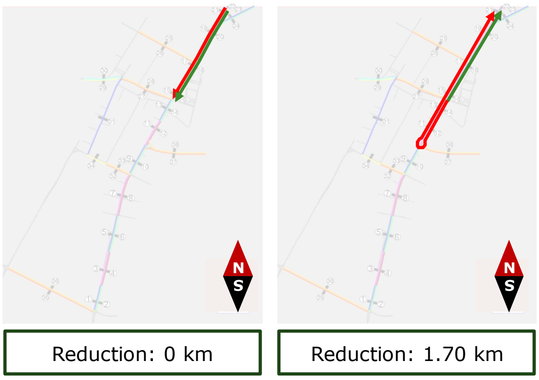
	Cars	Public Transport	Trucks	Motorcycle	Total
Total length of road network		20.43 km			
Average traffic in peak hour	795	55	26	182	
Price per km	$0.04 USD/km	$0.06 USD/km	$0.06 USD/km	$0.04 USD/km	
Total value of travel time at peak hour	$650	$68	$32	$149	**$899**

$$\begin{aligned} Benefit &= Current\ non\ fuel\ consumption\ at\ peak\ hour - non\ fuel\ consumption\ at\ peak\ hour\ with\ interventions \\ &= \$899 - \$899 = \$0 \end{aligned}$$

Finally, there is a potential distance saving benefit for the heavy trucks heading to and from Dr. Jules Sedney Terminal. The proposed bridge will have the capacity to withstand heavy traffic, preventing trucks from detouring; also, the interventions in Van 't Hogerhuysstraat will allow for trucks leaving the port and heading north to do so without heading to Jules Wijdenboshbrug roundabout as it happens today. This was analyzed separately as only trucks with operations in the port would be benefited:

Southbound truck traffic heading to and from Dr. Jules Sedney Terminal

Northbound truck traffic heading to and from Dr. Jules Sedney Terminal



Non-fuel vehicle cost savings for trucks heading to and from Dr. Jules Sedney Terminal

Truck traffic source	Current route	Route with interventions	Distance savings	Savings per km	Truck traffic to the port	Total savings
Southbound	9.96 km	5.84 km	4.12 km (41%)	~$0.06 USD/km	207 trucks/day	$50 USD/day
Northbound	4.03 km	2.33 km	1.70 km (42%)		62 trucks/day	$6 USD/day

Source: Cal B/C Cost-Benefit Analysis methodology

2.3.2. Generalized Travel Costs

The generalized travel costs of the network in peak hour with interventions are **$5,078** for the value of travel time, and vehicle operating costs. The benefits of the interventions are **$1,375 USD** at peak hour, plus a daily **$56 USD** for the non-fuel related costs reductions on trucks heading to and from Dr. Jules Sedney Terminal. This would be the benefits under current conditions if the interventions were ready and available. To determine the expected benefits, the traffic behavior was modeled with and without interventions for each passing year, adjusting the system's vehicle number based on the expected growth as will be explained up next. The benefits are expected to be obtained starting from 2024.

2.3.3. Benefits from the Interventions

Four travel sections were created as a way to group the 38 smaller road sections analyzed in the main trajectories made by the vehicles. These travel sections are the following:

1. **Van 't Hogerhuysstraat (Northbound):** Road sections 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23
2. **Van 't Hogerhuysstraat (Southbound):** Road sections 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
3. **Willem Campagnestraat Circuit:** Road sections 27, 28, 29, 30, 31, 32, 33, 34
4. **Other access roads:** Road sections 25, 26, 35, 36, 37, 38

The benefits achieved by the project per each km in each of the travel sections analyzed can be seen in the following tables.

- **Travel Time Costs**

The travel time reduction in the sections is within the range of 17% to 36%. The reduction of times is detailed in the following table:

Transport Travel (TT) time costs

Section	Current situation (2018)			Scenario with interventions (2024)			Reduction of Travel Time		
	Speed (km/h)	TTT (min)	TTT (min/km)	Speed (km/h)	TTT (min)	TTT (min/km)	TTT (min)	TTT (min/km)	% TTT
1. Van 't Hogerhuysstraat Northbound	26.39	12.41	2.27	36.16	9.05	1.66	3.35	0.61	-27%
2. Van 't Hogerhuysstraat Southbound	31.16	10.50	1.93	36.82	8.89	1.63	1.61	0.30	-15%
3. Willem Campagnestraat Circuit	29.01	8.96	2.07	37.23	6.98	1.61	1.98	0.46	-22%
4. Other access roads	24.32	12.78	2.47	36.22	8.58	1.66	4.20	0.81	-33%

The Transport Travel Time costs may be determined for each of the types of transportation according to the value of TTT for each type of user. For instance, these time reductions generate savings from $0.026 to $0.71 USD/km in the following sections for private cars.

Transport Travel Time (TTT) Costs

Section	TTT cost in Current Situation (2018) (USD/km per unit)				TTT cost with interventions (2024) (USD/km per unit)				TTT cost reduction (USD/km per unit)			
1. Van 't Hogerhuysstraat Northbound	$0.182	$0.843	$0.036	$0.050	$0.133	$0.615	$0.027	$0.036	$0.049	$0.228	$0.010	$0.013
2. Van 't Hogerhuysstraat Southbound	$0.154	$0.714	$0.031	$0.042	$0.131	$0.604	$0.026	$0.036	$0.024	$0.110	$0.005	$0.006
3. Willem Campagnestraat Circuit	$0.166	$0.767	$0.033	$0.045	$0.129	$0.597	$0.026	$0.035	$0.037	$0.169	$0.007	$0.010
4. Other access roads	$0.198	$0.914	$0.039	$0.054	$0.127	$0.587	$0.025	$0.035	$0.071	$0.327	$0.014	$0.019

- **Vehicle Operating Costs**

As detailed in the proposed interventions, the reduction of Vehicle Operating Costs (VOC) is mainly focused in the fuel related costs, as previously detailed. This is due to the fact that the distance remains the same for most of the users. The reduction of these costs is detailed in the following table for each type of user.

Fuel related costs

Section	Fuel cost in Current Situation (2018) (USD/km per unit)				Fuel cost with interventions (2024) (USD/km per unit)				Fuel cost reduction (USD/km per unit)			
1. Van 't Hogerhuysstraat Northbound	$0.095	$0.197	$0.197	$0.095	$0.079	$0.167	$0.167	$0.079	$0.016	$0.030	$0.030	$0.016
2. Van 't Hogerhuysstraat Southbound	$0.087	$0.184	$0.184	$0.087	$0.077	$0.166	$0.166	$0.077	$0.010	$0.018	$0.018	$0.010
3. Willem Campagnestraat Circuit	$0.091	$0.190	$0.190	$0.091	$0.076	$0.164	$0.164	$0.076	$0.014	$0.025	$0.025	$0.014
4. Other access roads	$0.085	$0.180	$0.180	$0.085	$0.078	$0.167	$0.167	$0.078	$0.006	$0.013	$0.013	$0.006

- **Generalized Travel Costs**

According to the previous two elements, the savings in the Generalized Travel Costs will be achieved by the sum of the previous factors. The savings per km are summarized in the following table.

Transport Travel Time and Fuel Costs

Section	Total cost Current Situation (USD/km per unit)				Total cost with interventions (USD/km per unit)				Total cost reduction (USD/km per unit)			
1. Van 't Hogerhuysstraat Northbound	$0.277	$1.040	$0.233	$0.144	$0.211	$0.782	$0.194	$0.115	$0.066	$0.257	$0.040	$0.030
2. Van 't Hogerhuysstraat Southbound	$0.242	$0.897	$0.215	$0.129	$0.208	$0.770	$0.192	$0.113	$0.034	$0.128	$0.023	$0.016
3. Willem Campagnestraat Circuit	$0.256	$0.956	$0.223	$0.136	$0.206	$0.762	$0.190	$0.112	$0.051	$0.195	$0.033	$0.024
4. Other access roads	$0.282	$1.094	$0.219	$0.138	$0.211	$0.781	$0.194	$0.114	$0.071	$0.313	$0.026	$0.024

2.1. Socioeconomic model

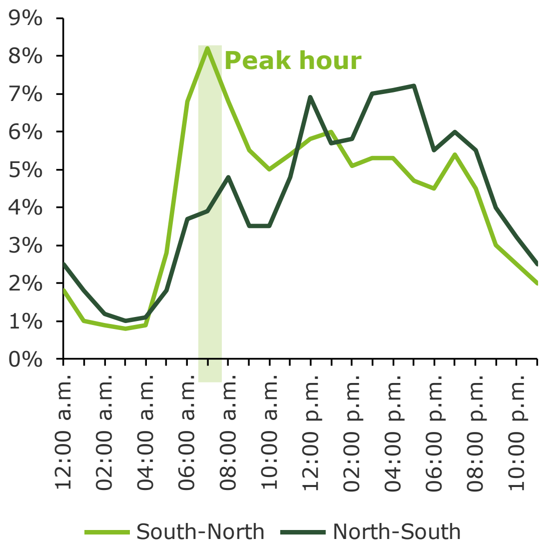
In this section, we will analyze the feasibility of the project under a socioeconomic point of view. For this, the following components are considered:

- **Benefits estimation:** Considering the impact of the interventions in the different hours of the day and during the complete timeframe of the project.
- **Capital Expenditure (CAPEX):** Considering the proposed interventions in the road, bridge, and the port and adjusted to Suriname context.
- **Socioeconomic model:** Considering Suriname context and analyzing potential risks' impact throughout a sensibility analysis.

2.1.1. Benefits from the Interventions

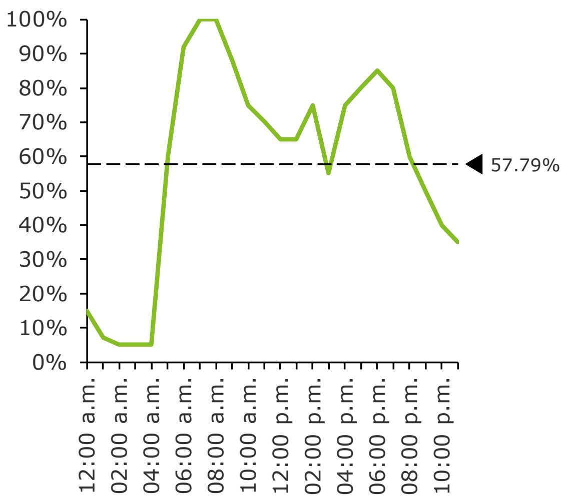
As detailed in the previous sections, the proposed interventions may generate a reduction in the generalized travel costs of the network in peak hour of **$1,375 USD by 2018**, if interventions were implemented. The peak hour is the time frame where the most benefits will be obtained, but on the rest of the day benefits with a lesser magnitude will be observed. To calculate this benefits, an absorption curve was modeled:

Daily Traffic Profile per Direction
% of daily traffic per hour, 2018



The peak hour is when the benefits are maximized (100%). Throughout the day, these will vary depending on the traffic.

Benefits absorption curve
% of total benefits per hour, 2018



- **In average, 57.79% of the peak hour benefits are obtained each hour.**
- **This means that daily benefits are 13.87x peak hour benefits.**

Source: Technical visit measurements and microsimulation results, Transconsult

In average, each hour will yield 57.79% of the peak hour benefits, meaning that the multiplier to calculate the daily benefits of the interventions is 13.87. The application of this multiplier would result in the next global daily benefits, which then were annualized:

2018	Peak hour benefits	Multiplier	Daily benefits[7]	Annual benefits
Travel time benefits	$1,025	13.87	$14,231	$5,194,315
Fuel consumption benefits	$350		$4,854	$1,771,710
Non-fuel benefits	-	-	$56	$14,560[8]
		TOTAL	$19,101	$6,980,585

In order to estimate the benefits of the proposed interventions in multiple years, it was necessary to forecast the behavior of the traffic in the network under the current situation and the intervened one. To do so, a traffic elasticity analysis was executed. The chosen variables were GDP and employment and elasticities between traffic growth and each of the variables was calculated for different time periods. The GDP was chosen as the best variable to forecast the traffic growth.

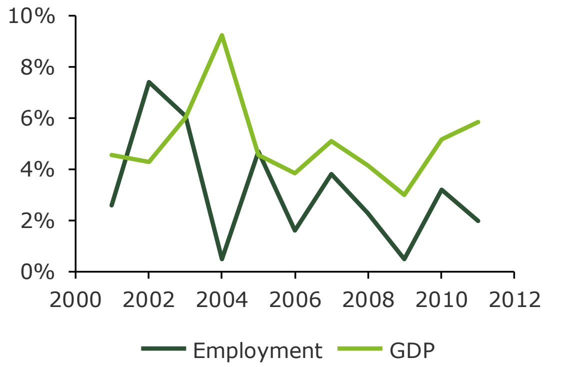
[7] Figures might not add up due to decimal approximations

[8] For non-fuel benefits, 5 days a week are considered for the annual amount due to Dr. Jules Sedney Terminal opening days (52 weeks x 5 working days)

From 2018 to 2023, the annual growth rate for the GDP was 2.78% according to the International Monetary Fund predictions. From 2024 to 2040, a 2.19% growth rate was used linearly to reduce long-term volatility.

The GDP elasticity was then applied with each of the growth rates to estimate the traffic growth forecast for each year. The traffic is not expected to grow at a higher rate with the project because the interventions are focused on a small section of the network. Usually, induced demand is expected in road infrastructure that has a significant increase of capacity which changes the traffic dynamics within a city; however, this effect is not expected in the proposed interventions of this particular segment of the road. In the specific case of truck traffic, redistributions are expected as the weight restriction of Saramaccabrug will be eliminated; this will not increase the traffic, though, as the vehicle number will keep its current growth in both scenarios. This prediction was then applied to the microsimulation data with and without the interventions.

Traffic elasticity variables
Employment & GDP, illustrative



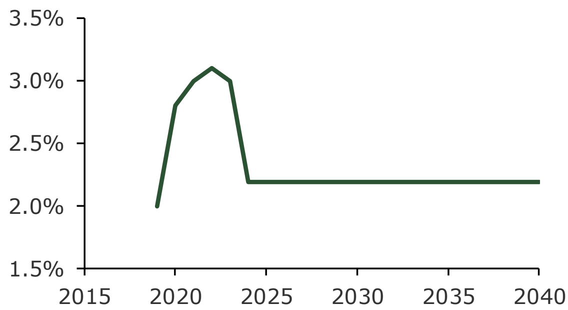
Variables	CAGR 96'-18'	CAGR 96'-08'	CAGR 08'-18'
Traffic (T)	2.89%	4.27%	1.25%
Employment (E)	1.96%	3.17%	0.53%
GDP	2.76%	3.98%	1.32%

Elasticities	CAGR 96'-18'	CAGR 96'-08'	CAGR 08'-18'	Average
T/E	1.473	1.348	2.355	1.725
T/GDP	1.046	1.073	0.953	1.024

Traffic growth forecast
GDP elasticity annual growth, 2019-2030

The following was considered:

- **2018-2023:** CAGR 2.78% (IMF predictions)
- **2024-2040:** GAGR 2.19%. From 2024 onwards, GDP growth rate was linearized to reduce long-term volatility.



Year	GDP	Traffic
2019-2022	2.97%	3.04%
2023-2026	2.19%	2.25%
2027-2040	2.19%	2.25%

Source: World Bank | Suriname General Bureau of Statistics | International Monetary Fund | Transconsult analysis

The same benefit analysis previously described was executed for each year's traffic conditions, modeling the current situation and the one with interventions in the microsimulation in order to obtain the total annual benefits of the interventions in the future. The truck distance savings were also estimated for each further year, but it won't be as significant for the overall benefits. The intervention works are expected to start in 2020, and benefits are expected to be obtain until 2024. The benefits would then start with the following estimations for 2024:

2024: Benefits Year 1	Peak hour benefits	Multiplier	Daily benefits[9]	Annual benefits
Travel time benefits	$2,225	13.87	$30,866	$11,265,993
Fuel consumption benefits	$696		$9,652	$3,523,096
Non-fuel benefits	-	-	$63	$16,300[10]
		TOTAL	$40,581	$14,805,388

[9] Figures might not add up due to decimal approximations

[10] For non-fuel benefits, 5 days a week are considered for the annual amount due to Dr. Jules Sedney Terminal opening days (52 weeks x 5 working days)

The current congestion, while severe, can be manageable by the authorities and the people of Suriname, yet as the traffic grows, the situation will become more critical. A travel time analysis for each of the four travel sections previously mentioned was done, showing that the congestion problems will increase and worsen with time[11]:

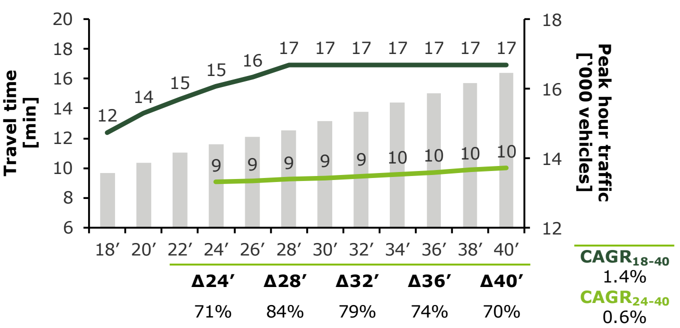
- **Van 't Hogerhuysstraat from South to North:** The benefits in 2024 represent a 71% reduction of the situation without interventions in the same year with a travel time going from 15.49 to 9.05 minutes. With the expected traffic growths, the travel time without interventions would reach a maximum of 16.96 minutes, while the one with interventions would be 10.00 minutes, a 70% reduction.

- **Van 't Hogerhuysstraat from North to South:** The benefits in 2024 represents are 30% less travel time from 11.60 to 8.89 minutes. In 2040, this gap would reach a 31% reduction going from 12.18 to 9.32 minutes.

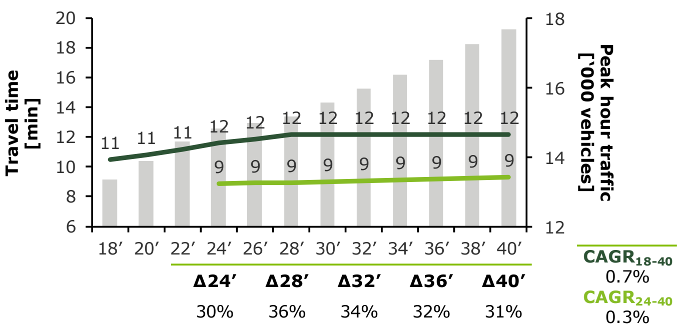
- **Willem Campagnestraat Circuit:** The travel time decrease in 2024 represents a 124% reduction, from 15.62 to 6.98 minutes. In 2040, this gap would reach 83%, as Hernhutterstraat is one of the most critical roads in the network.

- **Other access roads:** In these complementary roads, leaded in congestion by Jules Wijdenboschbrug, the travel time reduction would be of 119% in 2024 from 18.77 to 8.58 minutes; and reach 98%, from 20.10 to 10.17 minutes in 2040.

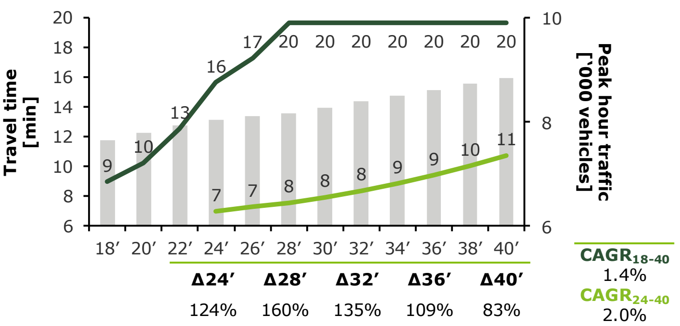
1. Van 't Hogerhuysstraat (S-N)
Travel time scenarios and peak hour traffic



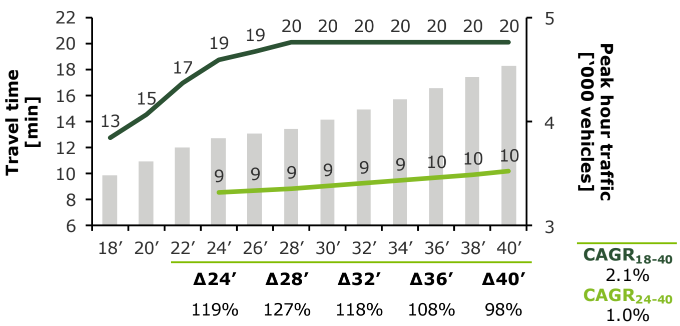
2. Van 't Hogerhuysstraat (N-S)
Travel time scenarios and peak hour traffic



3. Willem Campagnestraat Circuit
Travel time scenarios and peak hour traffic



4. Other access roads
Travel time scenarios and peak hour traffic



Without interventions — With interventions — Peak hour traffic

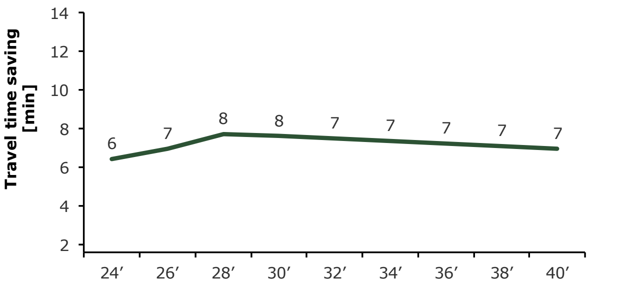
Source: Technical visit measurements and microsimulation results, Transconsult

[11] CAGRs where calculated in different periods due to the interventions being ready until 2024

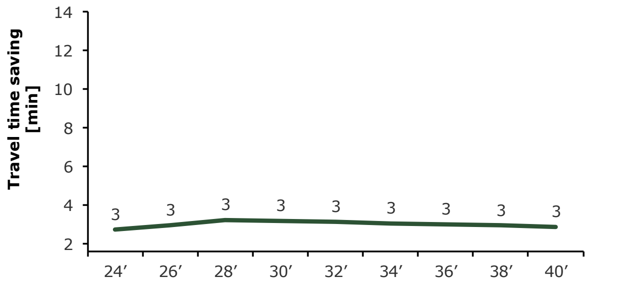
This analysis shows that the current infrastructure is not equipped to give service to the current traffic. Travel times could reach critical figures in a 6-year period. These results mean that as time passes, the benefits will increase, because the scenario without interventions will yield critical travel times. Once the peak is obtained in 2028, benefits will begin to decrease as travel times are not expected to get worse without the interventions after a certain time, while the travel times will keep increasing for intervened roads.

For travel times per travel section, the benefits will evolve as follows:

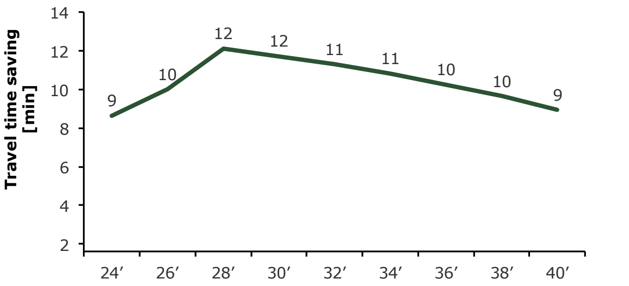
1. Van 't Hogerhuysstraat (S-N)
Travel time benefits



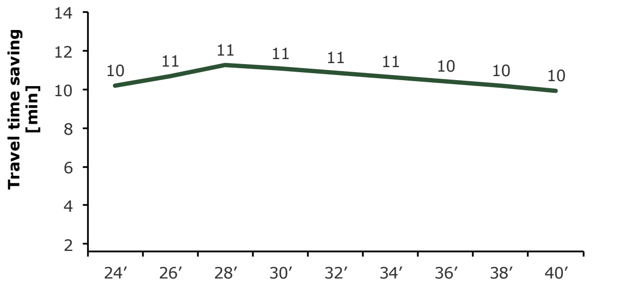
2. Van 't Hogerhuysstraat (N-S)
Travel time benefits



3. Willem Campagnestraat Circuit
Travel time benefits



4. Other access roads
Travel time benefits



Source: Technical visit measurements and microsimulation results, Transconsult

Each time saving per section is considered for all vehicles each year at peak hour. The same expansion factor is then applied as well as each individual vehicle cost as a constant value. This allowed for the travel time benefits to be quantified yearly.

Savings per vehicle type in analyzed roads (Total hours at peak hour)

Vehicle Type	2024	2025	2026	2027	2028	2029	2030	2031
Cars	360	381	403	430	465	460	456	451
Public Transport	17	18	19	21	22	22	22	22
Trucks	9	10	11	13	14	14	13	12
Motorcycle	74	77	79	82	87	86	84	83

Vehicle Type	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cars	446	440	435	429	423	417	410	403	396
Public Transport	22	22	22	22	22	22	22	22	22
Trucks	11	11	10	9	8	7	6	5	4
Motorcycle	82	81	80	78	77	76	74	73	71

Savings per vehicle type in analyzed roads (Total hours per day)

Vehicle Type	2024	2025	2026	2027	2028	2029	2030	2031
Cars	5,000	5,289	5,591	5,963	6,447	6,384	6,318	6,250
Public Transport	242	256	270	287	310	310	309	309
Trucks	130	142	157	176	200	190	180	169
Motorcycle	1,026	1,062	1,098	1,143	1,201	1,186	1,171	1,155

Vehicle Type	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cars	6,179	6,106	6,029	5,949	5,866	5,779	5,688	5,593	5,493
Public Transport	309	308	308	307	306	306	305	304	303
Trucks	158	147	135	122	109	96	82	67	52
Motorcycle	1,139	1,122	1,105	1,087	1,069	1,050	1,031	1,010	989

Savings per vehicle type in analyzed roads (Total USD per day)

Vehicle Type	2024	2025	2026	2027	2028	2029	2030	2031
Cars	$ 24,029	$ 25,416	$ 26,868	$ 28,657	$ 30,982	$ 30,678	$ 30,363	$ 30,036
Public Transport	$ 5,370	$ 5,701	$ 6,010	$ 6,392	$ 6,894	$ 6,888	$ 6,880	$ 6,871
Trucks	$ 125	$ 137	$ 151	$ 169	$ 192	$ 183	$ 173	$ 163
Motorcycle	$ 1,342	$ 1,390	$ 1,437	$ 1,495	$ 1,571	$ 1,551	$ 1,531	$ 1,511
Daily (USD)	**$30,866**	**$32,644**	**$34,466**	**$36,712**	**$39,640**	**$39,300**	**$38,947**	**$38,581**
Annual (MM USD)	**$ 11.27**	**$ 11.92**	**$ 12.58**	**$ 13.40**	**$ 14.47**	**$ 14.34**	**$ 14.22**	**$ 14.08**

Vehicle Type	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cars	$ 29,696	$ 29,342	$ 28,974	$ 28,590	$ 28,190	$ 27,771	$ 27,334	$ 26,877	$ 26,398
Public Transport	$ 6,862	$ 6,851	$ 6,839	$ 6,826	$ 6,811	$ 6,795	$ 6,777	$ 6,758	$ 6,736
Trucks	$ 152	$ 141	$ 129	$ 118	$ 105	$ 92	$ 79	$ 64	$ 50
Motorcycle	$ 1,490	$ 1,468	$ 1,445	$ 1,422	$ 1,398	$ 1,373	$ 1,348	$ 1,321	$ 1,294
Daily (USD)	**$38,199**	**$37,802**	**$37,388**	**$36,955**	**$36,504**	**$36,032**	**$35,538**	**$35,020**	**$34,478**
Annual (MM USD)	**$ 13.94**	**$ 13.80**	**$ 13.65**	**$ 13.49**	**$ 13.32**	**$ 13.15**	**$ 12.97**	**$ 12.78**	**$ 12.58**

The same considerations were made for the fuel consumption, which is also affected by the increase of speed during the years to gain benefits. Just like the time travel savings, fuel consumption benefits will decrease after reaching a peak where traffic can no longer be reduced on time. The benefits on time are the following:

Savings per vehicle type in analyzed roads (Total fuel lt at peak hour)

Vehicle Type	2024	2025	2026	2027	2028	2029	2030	2031
Cars	652	686	723	764	812	810	808	806
Public Transport	65	69	73	77	83	83	83	82
Trucks	38	40	43	46	50	51	52	53
Motorcycle	137	142	148	155	163	163	163	163

Vehicle Type	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cars	805	803	801	799	797	795	794	792	790
Public Transport	82	82	82	82	81	81	81	80	80
Trucks	53	54	54	55	55	55	55	55	55
Motorcycle	164	164	164	164	164	164	165	165	165

Savings per vehicle type in analyzed roads (Total hours per day)

Vehicle Type	2024	2025	2026	2027	2028	2029	2030	2031
Cars	9,042	9,514	10,023	10,600	11,256	11,232	11,208	11,184
Public Transport	902	954	1,009	1,074	1,151	1,149	1,147	1,144
Trucks	526	557	596	643	697	710	721	731
Motorcycle	1,898	1,976	2,058	2,151	2,257	2,261	2,264	2,266

Vehicle Type	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cars	11,159	11,134	11,109	11,084	11,059	11,033	11,009	10,984	10,959
Public Transport	1,141	1,138	1,135	1,131	1,127	1,122	1,118	1,113	1,107
Trucks	740	748	754	759	763	765	766	765	762
Motorcycle	2,269	2,271	2,274	2,276	2,278	2,280	2,282	2,284	2,286

Savings per vehicle type in analyzed roads (Total USD per day)

Vehicle Type	2024	2025	2026	2027	2028	2029	2030	2031
Cars	$ 7,147	$ 7,521	$ 7,923	$ 8,380	$ 8,898	$ 8,879	$ 8,860	$ 8,841
Public Transport	$ 635	$ 671	$ 710	$ 756	$ 810	$ 809	$ 807	$ 805
Trucks	$ 370	$ 392	$ 420	$ 452	$ 491	$ 500	$ 508	$ 515
Motorcycle	$ 1,500	$ 1,562	$ 1,627	$ 1,701	$ 1,784	$ 1,787	$ 1,789	$ 1,792
Daily (USD)	**$ 9,652**	**$ 10,146**	**$ 10,680**	**$ 11,289**	**$ 11,983**	**$ 11,975**	**$ 11,965**	**$ 11,953**
Annual (MM USD)	**$ 3.52**	**$ 3.70**	**$ 3.90**	**$ 4.12**	**$ 4.37**	**$ 4.37**	**$ 4.37**	**$ 4.36**

Vehicle Type	2032	2033	2034	2035	2036	2037	2038	2039	2040
Cars	$ 8,821	$ 8,801	$ 8,782	$ 8,762	$ 8,742	$ 8,722	$ 8,702	$ 8,683	$ 8,663
Public Transport	$ 803	$ 801	$ 799	$ 796	$ 793	$ 790	$ 787	$ 783	$ 779
Trucks	$ 521	$ 526	$ 531	$ 534	$ 537	$ 538	$ 539	$ 538	$ 536
Motorcycle	$ 1,794	$ 1,796	$ 1,797	$ 1,799	$ 1,801	$ 1,802	$ 1,804	$ 1,806	$ 1,807
Daily (USD)	**$ 11,939**	**$ 11,925**	**$ 11,909**	**$ 11,891**	**$ 11,873**	**$ 11,853**	**$ 11,832**	**$ 11,810**	**$ 11,786**
Annual (MM USD)	**$ 4.36**	**$ 4.35**	**$ 4.35**	**$ 4.34**	**$ 4.33**	**$ 4.33**	**$ 4.32**	**$ 4.31**	**$ 4.30**

Finally, non-fuel vehicles costs savings were estimated based on the expected TEU annual capacity and the trucks needed to move the freight. Southbound and northbound distribution was maintained throughout the years, as well as the cost per km for each truck. The results are the following:

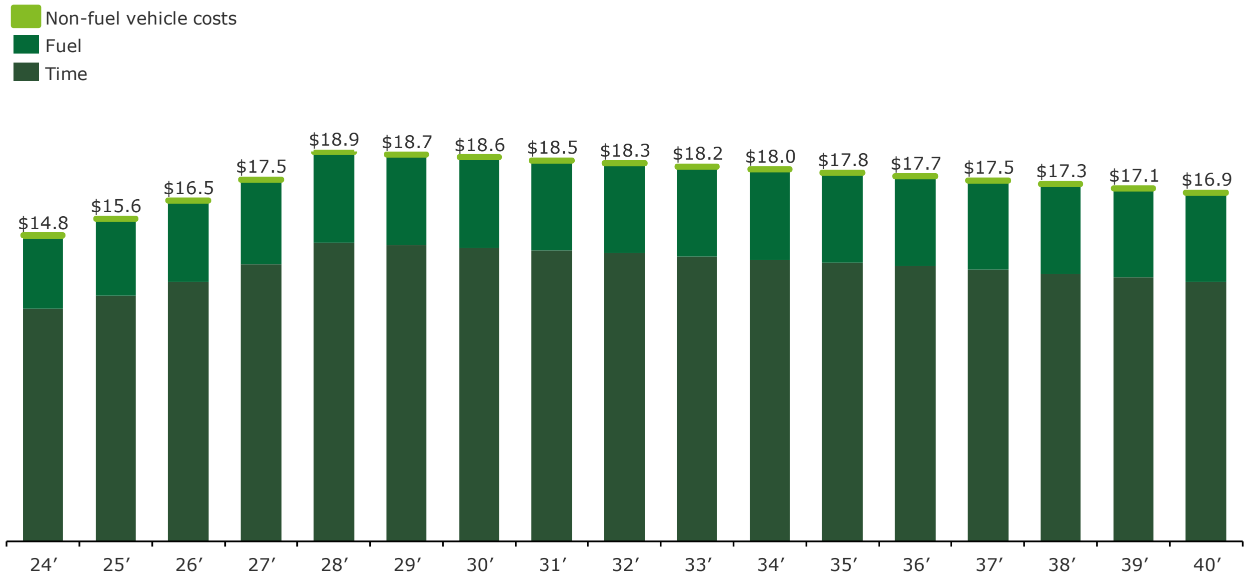
Total Daily Port Traffic

Year	2024	2025	2026	2027	2028	2029	2030	2031
Traffic (trucks/day)	303	309	315	321	328	334	341	348
Traffic (trucks/year)	78,764	80,339	81,946	83,585	85,256	86,962	88,701	90,475
Northbound annual trucks	18,116	18,478	18,848	19,224	19,609	20,001	20,401	20,809
Southound annual truck	60,648	61,861	63,098	64,360	65,647	66,960	68,300	69,666
Northbound annual saved distance [km]	30,797	31,413	32,041	32,682	33,335	34,002	34,682	35,376
Southbound annual saved distance [km]	249,628	254,620	259,713	264,907	270,205	275,609	281,121	286,744
Total annual non-fuel savings (USD)	**$ 16,300**	**$ 16,626**	**$ 16,958**	**$ 17,297**	**$ 17,643**	**$ 17,996**	**$ 18,356**	**$ 18,723**

Year	2032	2033	2034	2035	2036	2037	2038	2039	2040
Traffic (trucks/day)	355	362	369	377	384	392	400	400	400
Traffic (trucks/year)	92,284	94,130	96,013	97,933	99,892	101,889	103,927	103,927	103,927
Northbound annual trucks	21,225	21,650	22,083	22,525	22,975	23,435	23,903	23,903	23,903
Southound annual truck	71,059	72,480	73,930	75,408	76,916	78,455	80,024	80,024	80,024
Northbound annual saved distance [km]	36,083	36,805	37,541	38,292	39,058	39,839	40,636	40,636	40,636
Southbound annual saved distance [km]	292,479	298,328	304,295	310,381	316,588	322,920	329,378	329,378	329,378
Total annual non-fuel savings (USD)	**$ 19,098**	**$ 19,480**	**$ 19,869**	**$ 20,267**	**$ 20,672**	**$ 21,085**	**$ 21,507**	**$ 21,507**	**$ 21,507**

The cost-benefit analysis only started to account benefits in 2024 of $14,805,388 USD, with the following behavior over time until 2040:

Expected social benefits of the proposed interventions
Million USD, 2020-2040



Source: Technical visit measurements and microsimulation results, Transconsult | Deloitte analysis

The value of time and fuel consumption benefits make up almost all the projected benefits. This due to the main effects of the interventions being travel time reductions and an efficient fuel consumption in the network. Non-fuel vehicle costs are not so significant considering that the travelled distance is not really reduced for most of the vehicles, and even for the trucks, not all of them will take advantage of the bridge.

Other benefits

It is important to mention that some benefits have not been able to be quantified at this stage of the project due to lack of existing information. This was not obtained due to the high costs it would imply and that based on interviews with stakeholders, field work, and the experts' opinion its impact on the cost benefit analysis would not be significant. These benefits include the following, amongst others:

- **Pedestrians and cyclists:** The proposed sidewalk and bikeways can increase the safety of the corridor and provide fully equipped that will prevent accidents and illegal parking.
- **Recovery of urban spaces:** Communities next to the port with better roads and a possible recovery of urban spaces in Jules Wijdenboschbrug, and the port with more efficient systems and designated truck areas to improve operations.

2.1.2. Capital expenditures (CAPEX)

The socioeconomic model takes into the account the interventions' associated CAPEX to determine its financial feasibility. The estimated CAPEX was calculated by taking into account the proposed interventions in previous sections and by using the next methodology:

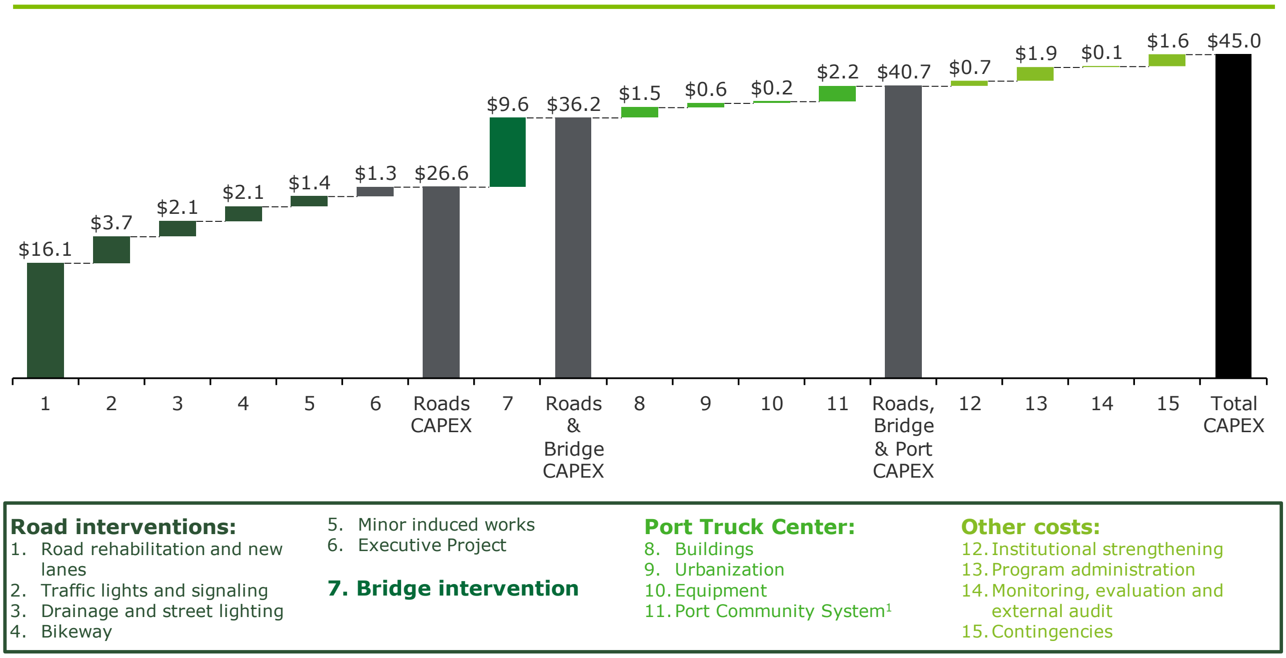
- **CAPEX estimation for the proposed interventions:** Use of parametric costs of the components of the investment.

- **Estimated costs & price disparity analysis:** For the roads, a technical solution based on the American standard was used to estimate the costs for pavement construction; the milling involved in the process makes the process more expensive. Exchange rates were based in the Central Bank of Suriname exchange rates; and the World Bank Purchasing Power Parity information was used to adjust some of the components to the Surinamese context. For the roads & bridge CAPEX, similar projects in Mexico, Colombia and Guyana were studied; in the case of the port interventions, works in Mexico, Peru, Jamaica and Colombia were studied.

- **Contrast of the parametric costs:** Finally, the estimated costs were contrasted with the Ministry of Public Works to adjust any discrepancies or use other references.

The estimated **CAPEX for the interventions was 45.0 million USD**, which included the roads ($26.6 million USD), the new Saramaccabrug ($9.6 million USD), the port interventions ($2.3 million USD), the implementation of a Port Community System (2.2 million), institutional strengthening ($0.7 million USD), program administration costs ($1.9 MM USD), monitoring, evaluation and external audit ($0.1 million USD), and contingencies ($1.6 million USD).

Proposed interventions CAPEX
Million of US dollars



[1]According to the technology developments of the port, the Port Community System license and implementation costs might be reduced
Source: Deloitte & Transconsult analysis

The next tables will show the breakdown of the CAPEX:

Item	# Units	Unit Price ($USD)	CAPEX (k $USD)
1. Road rehabilitation and additional lanes			**$16,062**
Pavement milling and re-asphalting of existing roads	91,350 m²	$65	$5,914
Sidewalks	80,361 m²	$56	$4,519
Additional lane constructions	33,946 m²	$112	$3,800
Reinforced concrete contention wall	1,689 m	$837	$1,414
Demolition of concrete surfaces in roundabout areas	7,364 m²	$56	$415
2. Traffic lights and signaling			**$3,712**
Traffic lights with control systems and 4 phases	10 intersections	$202,151	$2,022
Vertical and horizontal signage	14,709 m	$74	$1,085
Bus stops	38 stops	$15,929	$605
3. Drainage and street lighting			**$2,120**
Storm drainage reconfiguration	7,355 m	$231	$1,695
Street lighting reconfiguration	7,355 m	$58	$425
4. Bikelane	**22,289 m²**	**$92**	**$2,054**
5. Minor induced works			**$1,377**
Formwork of optic fiber	7,355 m	$65	$474
Formwork of telephone lines	7,355 m	$32	$237
Releveling of well covers, valve boxes and other hydraulics	14 km	$15,791	$221
Sanitary drainage reconfiguration	1,683 m	$95	$159
Low tension posts relocation	32 units	$3,622	$116
Drinking water bypass	28 units	$3,473	$97
Street light posts dismantling	7,355 m	$10	$73
6. Executive project	**1 project**	**$1,274,459**	**$1,275**
7. Bridge	**1 bridge**	**$9,600,000**	**$9,600**
Access roads and bridge interventions CAPEX			**$36,200**

Item	# Units	Unit Price ($USD)	CAPEX (k $USD)
8. Truck Center buildings			**$1,499**
Parking for heavy traffic	13,383 m²	$86	$1,158
Parking for light vehicles	3,265 m²	$44	$145
Waiting area	335 m²	$320	$107
Rest area	200 m²	$447	$89
9. Truck Center urbanization			**$551**
Roads	3,437 m²	$86	$297
Land preparation	17,183 m²	$9	$150
Water and sewerage network	344 m²	$107	$37
Perimeter	524 m	$68	$36
Electrical network	344 m²	$66	$23
Illumination	17,183 m²	$0.28	$5
Green zone	1,203 m²	$3	$3
10.Truck Center equipment			**$210**
Truck TAG	250 units	$475	$119
Driver TAG	250 units	$155	$39
Parking gates boom barrier	8 units	$3,049	$24
RFID reader	10 units	$1,169	$11
Computer	10 units	$966	$10
Biometric readers	2 units	$2,033	$4
Display screens	2 units	$1,433	$3
11. Port Community System	**1 unit**	**$2,200,000**	**$2,200**
Port Truck Center and Port Community System CAPEX			**$4,460**
Subtotal Roads, Bridge and Port CAPEX			**$40,660**
12. Institutional strengthening	**1 unit**	**$700,000**	**$700**
13. Program administration	**1 unit**	**$1,895,000**	**$1,895**
14. Monitoring, evaluation and external audit*	**1 unit**	**$105,000**	**$105**
15. Contingencies*	**1 unit**	**$1,640,000**	**$1,640**
Total CAPEX			**$45,000**

For the cost-benefit analysis, the monitoring, evaluation and external audit*; and contingencies* costs are not considering ($1,745,000 USD). **The total CAPEX for the cost-benefit analysis is $43,255,000 USD**.

2.1.1. Maintenance costs

The socioeconomic model takes into the account the interventions' associated maintenance cost in order for the road to maintain the expected Level of Service (LoS) to determine its financial feasibility. The estimated maintenance cost was calculated by taking into account the proposed interventions in previous sections. The timeframe for mayor maintenance made in the infrastructure was made in each of the scenarios in order to maintain the expected level of service.

The maintenance costs include the rehabilitation of existing roads including pavement milling and re-asphalting. These costs are detailed in the following table.

Maintenance costs

Concept	Timeframe	Quantity	Unitary Cost	Total Cost
Scenario of current situation	10 years	91,350 m²	$50.00	$4,566,682.66
Scenario with interventions	5 years	125,296 m²	$50.00	$6,263,678.93

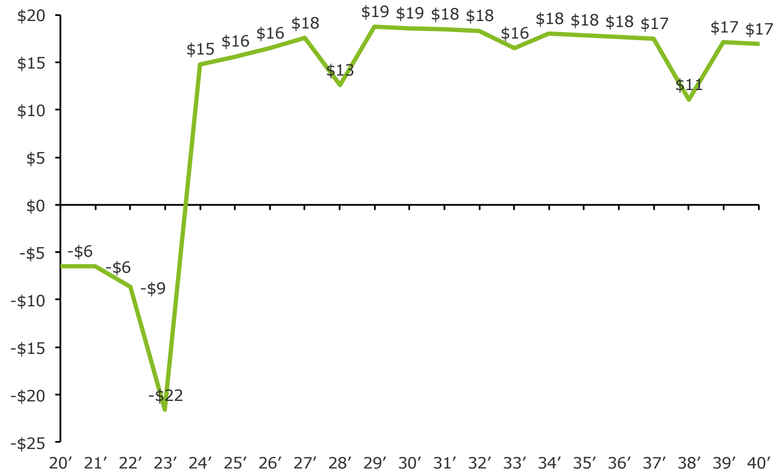
The maintenance cost was calculated by using parametric costs similar to the once used in the initial phase of the project.

2.1.2. Socioeconomic model

By taking into consideration the benefits and the CAPEX previously detailed, we have constructed the socioeconomic model for the project to confirm its feasibility.

The socioeconomic model was done for a 20-year timeframe. The discount rate chosen is 12%, used by the IDB in the evaluation of investment projects.

The cash flow was projected, considering that CAPEX disbursement starts in year 0 (2020) and continues in the following years based on the IDB regulations[12], and the next years are primarily gathering the social benefits until 2040. The results of the model are the following:



Considered hypothesis

Discount Rate	12% (Inter-American Development Bank
Timeframe	20 years

Results (constant prices)

CAPEX	$43.26 MM USD
IRR	27.99%
Social NPV	$43.90 MM USD
IAR	34.23%
Payback	6.22 years

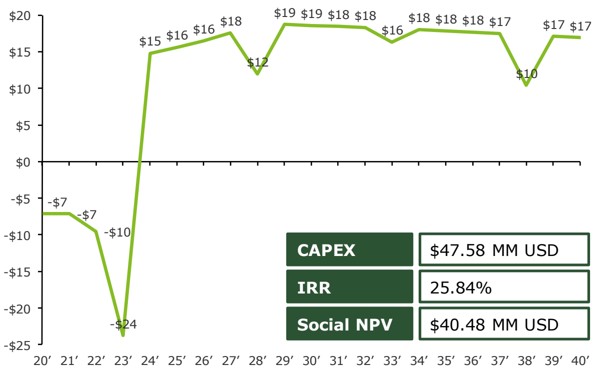
The project is feasible under a social perspective with an internal rate of return of 27.99%, and a social net present value of $43.90 million dollars.

Under the current interventions characteristics, the immediate rate of return (IAR) is 34.23% and a social payback can be expected at 6.22 years.

Additionally, a sensitivity analysis was conducted to look at the effect of deviations of the CAPEX and benefits in the IRR of the project. The consultant analyzed the socioeconomic feasibility of the project under three scenarios.

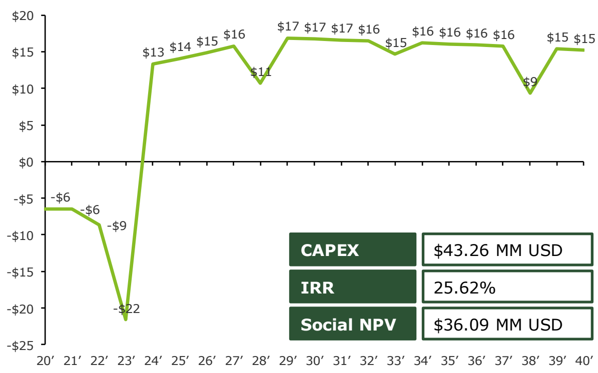
- **Scenario 1 - CAPEX increase by 10%:** The CAPEX could be affected by import tariffs and higher rates due to foreign prices, exchange rates and customs fees for the materials that can't be found locally.
- **Scenario 2 – Benefits decrease by 10%:** The benefits could be affected mainly by a travel time reduction that doesn't meet the expectations.
- **Scenario 3 – CAPEX increase by 10% and Benefits decrease by 10%:** Considers that both if the factor previously analyzed are affected at the same time.
- **Scenario 4 - CAPEX increase by 30%:** Higher impact of import tariffs, foreign prices, exchange rates and customs fees on the project.
- **Scenario 5 – Benefits decrease by 30%:** Travel times and fuel reductions are not as planned, affected by an increasing congestion and car growth, as well as lack of usage of the Port Truck Center.
- **Scenario 6 – CAPEX increase by 30% and Benefits decrease by 30%:** Considers that both if the factor previously analyzed are affected at the same time.

Project cash flow – scenario 1
Million USD, 2020-2040



CAPEX	$47.58 MM USD
IRR	25.84%
Social NPV	$40.48 MM USD

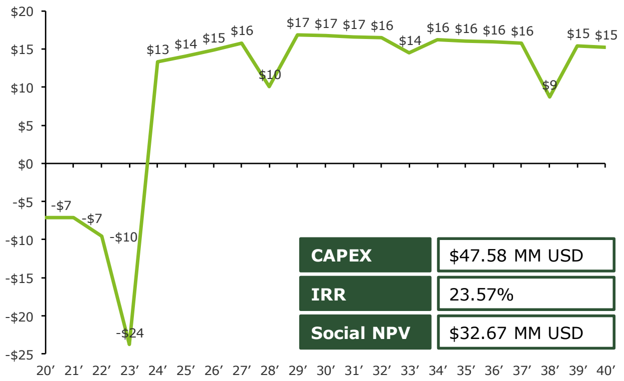
Project cash flow – scenario 2
Million USD, 2020-2040



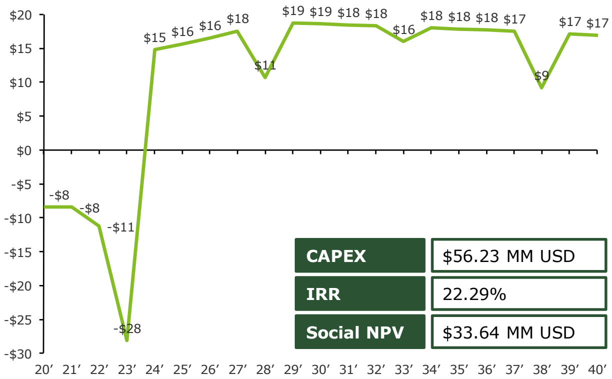
CAPEX	$43.26 MM USD
IRR	25.62%
Social NPV	$36.09 MM USD

[12] Pursuant to Document AB-2990, the disbursement of Bank financing will be subject to the following maximum limits: up to 15% during the first 12 months; up to 30% during the first 24 months; and up to 50% during the first 36 months

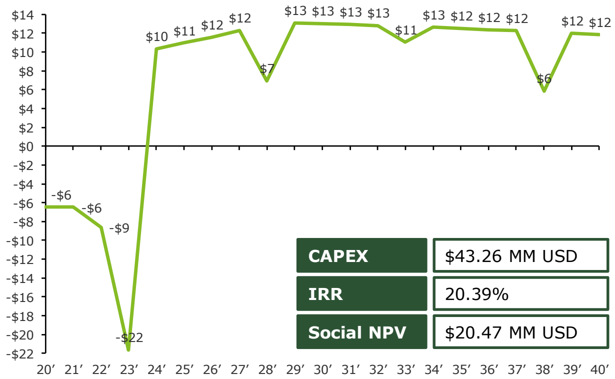
Project cash flow – scenario 3
Million USD, 2020-2040



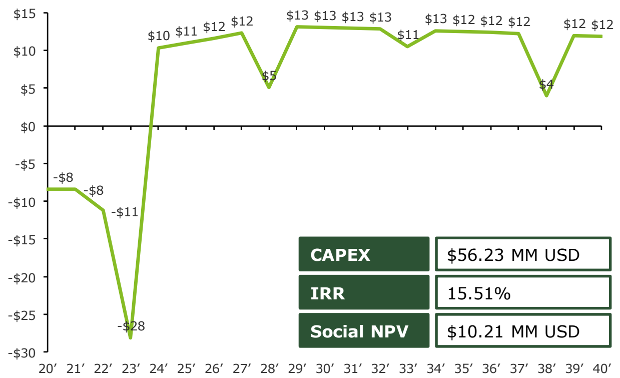
Project cash flow – scenario 4
Million USD, 2020-2040



Project cash flow – scenario 5
Million USD, 2020-2040



Project cash flow – scenario 6
Million USD, 2020-2040



As a result, it can be seen that the project, can withstand in the three scenarios in which there is a higher CAPEX or less benefits, and still have an IRR above the discount rate.

3. Annexes

3.1. Annex 4: Socioeconomic model

In this chapter, we include the detail of the estimations made for the socioeconomic model. This include the costs and benefits estimated for the scenarios "with" and "without" proposed interventions.

3.1.1. Tables from Scenario Without Interventions

Table A. Average speed and traffic by segment and vehicle composition in peak hour (Without Interventions)

ID	Road	Vehicles at peak hour	Car	Public transport	Trucks	Motorcycle	Average speed (km/hr)
1	Martin Luther Kingweg	1,239	1,048	52	31	108	41.19
2	Martin Luther Kingweg	1,240	1,049	52	31	108	41.23
3	Martin Luther Kingweg	1,241	978	80	10	173	40.50
4	Martin Luther Kingweg	1,684	1,327	108	14	235	40.28
5	Martin Luther Kingweg	1,337	1,054	86	11	186	41.36
6	Martin Luther Kingweg	1,311	1,014	94	8	195	16.98
7	Martin Luther Kingweg	1,224	947	88	7	182	8.83
8	Martin Luther Kingweg	1,051	792	77	12	170	34.37
9	Van 't Hogerhuysstraat	651	491	48	7	105	27.00
10	Van 't Hogerhuysstraat	1,010	628	176	8	197	38.56
11	Van 't Hogerhuysstraat	875	545	153	7	171	38.84
12	Van 't Hogerhuysstraat	441	302	83	15	42	20.33
13	Van 't Hogerhuysstraat	830	698	53	22	58	39.55
14	Van 't Hogerhuysstraat	834	701	53	22	58	40.95
15	Van 't Hogerhuysstraat	829	644	74	10	101	41.09
16	Van 't Hogerhuysstraat	850	660	76	10	104	31.91
17	Van 't Hogerhuysstraat	1,135	882	102	13	139	41.49
18	Van 't Hogerhuysstraat	1,414	1,127	117	40	130	42.48
19	Zwartenhovenbrugstraat	1,503	1,198	124	43	138	41.99
20	Zwartenhovenbrugstraat	1,282	1,007	114	33	128	21.46
21	Zwartenhovenbrugstraat	1,292	1,014	115	33	129	43.07
22	Zwartenhovenbrugstraat	1,282	899	208	21	154	38.67
23	Saramaccastraat	925	649	150	15	111	23.60
24	Saramaccastraat	441	225	17	6	193	16.55
25	Molenpad	144	114	12	4	13	42.76
26	Molenpad	337	277	6	3	50	42.01
27	Willem Campagnestraat	690	538	-	9	143	42.02
28	Willem Campagnestraat	853	712	11	89	41	38.98
29	Willem Campagnestraat	1,608	1,255	-	21	333	41.60
30	Willem Campagnestraat	978	816	13	101	48	35.85
31	Hernhutterstraat	1,664	1,422	22	49	170	15.87
32	Slangenhoutstraat	908	802	12	33	62	41.00
33	Slangenhoutstraat	194	155	8	18	14	41.60
34	Slangenhoutstraat	1,619	1,429	22	58	110	39.91
35	Latourweg	840	701	11	87	41	39.84
36	Latourweg	795	620	-	10	164	39.13
37	Jules Wijdenboschbrug	581	376	5	4	195	5.27
38	Jules Wijdenboschbrug	915	721	13	50	131	41.11

Table B. Gas consumption by type of transport and section (Without Interventions)

ID	Road	Auto fuel consumption (lt)	Truck fuel consumption (lt)
1	Martin Luther Kingweg	0.004	0.011
2	Martin Luther Kingweg	0.045	0.110
3	Martin Luther Kingweg	0.045	0.111
4	Martin Luther Kingweg	0.047	0.115
5	Martin Luther Kingweg	0.044	0.109
6	Martin Luther Kingweg	0.089	0.198
7	Martin Luther Kingweg	0.081	0.177
8	Martin Luther Kingweg	0.026	0.061
9	Van 't Hogerhuysstraat	0.064	0.147
10	Van 't Hogerhuysstraat	0.054	0.132
11	Van 't Hogerhuysstraat	0.052	0.127
12	Van 't Hogerhuysstraat	0.103	0.230
13	Van 't Hogerhuysstraat	0.005	0.011
14	Van 't Hogerhuysstraat	0.045	0.110
15	Van 't Hogerhuysstraat	0.045	0.110
16	Van 't Hogerhuysstraat	0.058	0.135
17	Van 't Hogerhuysstraat	0.044	0.109
18	Van 't Hogerhuysstraat	0.044	0.108
19	Zwartenhovenbrugstraat	0.031	0.076
20	Zwartenhovenbrugstraat	0.038	0.086
21	Zwartenhovenbrugstraat	0.043	0.108
22	Zwartenhovenbrugstraat	0.054	0.131
23	Saramaccastraat	0.080	0.182
24	Saramaccastraat	0.116	0.258
25	Molenpad	0.072	0.178
26	Molenpad	0.073	0.179
27	Willem Campagnestraat	0.062	0.154
28	Willem Campagnestraat	0.066	0.159
29	Willem Campagnestraat	0.041	0.101
30	Willem Campagnestraat	0.046	0.110
31	Hernhutterstraat	0.199	0.442
32	Slangenhoutstraat	0.030	0.073
33	Slangenhoutstraat	0.029	0.072
34	Slangenhoutstraat	0.023	0.057
35	Latourweg	0.114	0.278
36	Latourweg	0.116	0.281
37	Jules Wijdenboschbrug	0.134	0.292
38	Jules Wijdenboschbrug	0.046	0.114

Table C. Gas consumption by modal split and section (without interventions)

ID	Road	Cars (lt)	Public transport (lt)	Trucks (lt)	Motorcycle (lt)
1	Martin Luther Kingweg	5	1	1	<1
2	Martin Luther Kingweg	46	6	6	5
3	Martin Luther Kingweg	52	10	3	9
4	Martin Luther Kingweg	62	12	4	11
5	Martin Luther Kingweg	47	9	1	8
6	Martin Luther Kingweg	98	20	4	19
7	Martin Luther Kingweg	93	19	4	18
8	Martin Luther Kingweg	22	5	1	4
9	Van 't Hogerhuysstraat	37	8	1	7
10	Van 't Hogerhuysstraat	27	19	1	9
11	Van 't Hogerhuysstraat	20	14	1	6
12	Van 't Hogerhuysstraat	27	17	3	4
13	Van 't Hogerhuysstraat	4	1	<1	<1
14	Van 't Hogerhuysstraat	36	7	4	3
15	Van 't Hogerhuysstraat	34	10	3	5
16	Van 't Hogerhuysstraat	45	12	4	7
17	Van 't Hogerhuysstraat	47	13	2	7
18	Van 't Hogerhuysstraat	52	13	6	6
19	Zwartenhovenbrugstraat	37	9	4	4
20	Zwartenhovenbrugstraat	39	10	3	5
21	Zwartenhovenbrugstraat	42	12	3	5
22	Zwartenhovenbrugstraat	43	24	2	7
23	Saramaccastraat	50	26	3	8
24	Saramaccastraat	25	4	2	22
25	Molenpad	8	2	1	1
26	Molenpad	19	1	1	3
27	Willem Campagnestraat	30	-	1	8
28	Willem Campagnestraat	32	1	10	2
29	Willem Campagnestraat	51	-	2	14
30	Willem Campagnestraat	33	1	10	2
31	Hernhutterstraat	266	9	20	32
32	Slangenhoutstraat	22	1	2	2
33	Slangenhoutstraat	5	1	2	<1
34	Slangenhoutstraat	24	-	1	6
35	Latourweg	76	3	23	4
36	Latourweg	60	-	2	16
37	Jules Wijdenboschbrug	67	2	2	35
38	Jules Wijdenboschbrug	29	1	5	5
	TOTAL	**1,711**	**303**	**148**	**312**

3.1.2. Tables from Scenario Without Interventions

Table D. Average speed and traffic by segment and vehicle composition in peak hour (With Interventions)

ID	Road	Vehicles at peak hour	Car	Public transport	Trucks	Motorcycle	Average speed (km/hr)
1	Martin Luther Kingweg	1,237	1,025	51	56	105	41.70
2	Martin Luther Kingweg	1,238	1,026	51	56	106	41.17
3	Martin Luther Kingweg	1,468	1,144	93	29	202	40.87
4	Martin Luther Kingweg	1,680	1,309	107	33	231	40.83
5	Martin Luther Kingweg	1,340	1,056	86	11	187	40.82
6	Martin Luther Kingweg	1,443	1,106	102	23	212	40.72
7	Martin Luther Kingweg	1,491	1,143	106	23	219	31.80
8	Martin Luther Kingweg	1,109	836	81	12	163	38.56
9	Van 't Hogerhuysstraat	759	572	55	8	112	35.81
10	Van 't Hogerhuysstraat	807	502	141	6	158	32.41
11	Van 't Hogerhuysstraat	616	383	108	5	120	34.44
12	Van 't Hogerhuysstraat	387	265	73	13	37	35.38
13	Van 't Hogerhuysstraat	985	815	62	41	67	31.56
14	Van 't Hogerhuysstraat	983	814	62	41	67	41.77
15	Van 't Hogerhuysstraat	992	757	87	28	119	41.77
16	Van 't Hogerhuysstraat	1,025	783	90	29	123	38.73
17	Van 't Hogerhuysstraat	1,368	1,063	122	16	167	41.71
18	Van 't Hogerhuysstraat	1,509	1,193	124	54	138	40.99
19	Zwartenhovenbrugstraat	1,504	1,189	123	54	137	41.13
20	Zwartenhovenbrugstraat	1,299	1,020	116	34	130	30.44
21	Zwartenhovenbrugstraat	1,247	979	111	32	125	39.38
22	Zwartenhovenbrugstraat	1,124	788	182	18	135	37.67
23	Saramaccastraat	878	616	143	14	105	34.30
24	Saramaccastraat	428	218	17	6	187	30.56
25	Molenpad	143	114	12	4	13	28.99
26	Molenpad	313	258	5	3	47	40.27
27	Willem Campagnestraat	611	477	-	8	126	42.09
28	Willem Campagnestraat	585	488	8	61	28	41.35
29	Willem Campagnestraat	1,602	1,250	-	21	331	39.71
30	Willem Campagnestraat	850	709	11	88	41	38.39
31	Hernhutterstraat	1,561	1,334	21	46	160	40.37
32	Slangenhoutstraat	861	760	11	31	58	40.73
33	Slangenhoutstraat	230	184	9	21	16	42.27
34	Slangenhoutstraat	1,347	1,051	-	18	279	40.54
35	Latourweg	797	665	11	83	39	39.50
36	Latourweg	670	523	-	9	139	39.71
37	Jules Wijdenboschbrug	770	499	7	5	259	40.77
38	Jules Wijdenboschbrug	791	623	11	43	114	42.66

Table E. Gas consumption by type of transport and section (With Interventions)

ID	Road	Auto fuel consumption (lt)	Truck fuel consumption (lt)
1	Martin Luther Kingweg	0.004	0.011
2	Martin Luther Kingweg	0.045	0.110
3	Martin Luther Kingweg	0.045	0.110
4	Martin Luther Kingweg	0.047	0.114
5	Martin Luther Kingweg	0.045	0.110
6	Martin Luther Kingweg	0.045	0.110
7	Martin Luther Kingweg	0.039	0.091
8	Martin Luther Kingweg	0.023	0.057
9	Van 't Hogerhuysstraat	0.050	0.119
10	Van 't Hogerhuysstraat	0.063	0.148
11	Van 't Hogerhuysstraat	0.058	0.138
12	Van 't Hogerhuysstraat	0.065	0.155
13	Van 't Hogerhuysstraat	0.006	0.013
14	Van 't Hogerhuysstraat	0.044	0.109
15	Van 't Hogerhuysstraat	0.044	0.109
16	Van 't Hogerhuysstraat	0.049	0.118
17	Van 't Hogerhuysstraat	0.044	0.109
18	Van 't Hogerhuysstraat	0.045	0.110
19	Zwartenhovenbrugstraat	0.031	0.077
20	Zwartenhovenbrugstraat	0.029	0.067
21	Zwartenhovenbrugstraat	0.046	0.112
22	Zwartenhovenbrugstraat	0.055	0.134
23	Saramaccastraat	0.058	0.138
24	Saramaccastraat	0.074	0.172
25	Molenpad	0.100	0.230
26	Molenpad	0.075	0.183
27	Willem Campagnestraat	0.062	0.154
28	Willem Campagnestraat	0.063	0.155
29	Willem Campagnestraat	0.042	0.103
30	Willem Campagnestraat	0.043	0.105
31	Hernhutterstraat	0.098	0.239
32	Slangenhoutstraat	0.030	0.073
33	Slangenhoutstraat	0.029	0.072
34	Slangenhoutstraat	0.023	0.056
35	Latourweg	0.115	0.279
36	Latourweg	0.114	0.278
37	Jules Wijdenboschbrug	0.047	0.114
38	Jules Wijdenboschbrug	0.045	0.112

Table F. Gas consumption by modal split and section (With interventions)

ID	Road	Cars (lt)	Public transport (lt)	Trucks (lt)	Motorcycle (lt)
1	Martin Luther Kingweg	5	1	1	<1
2	Martin Luther Kingweg	46	6	6	5
3	Martin Luther Kingweg	51	10	3	9
4	Martin Luther Kingweg	61	12	4	11
5	Martin Luther Kingweg	47	9	1	8
6	Martin Luther Kingweg	50	11	2	10
7	Martin Luther Kingweg	44	10	2	9
8	Martin Luther Kingweg	20	5	1	4
9	Van 't Hogerhuysstraat	29	7	1	6
10	Van 't Hogerhuysstraat	32	21	1	10
11	Van 't Hogerhuysstraat	22	15	1	7
12	Van 't Hogerhuysstraat	17	11	2	2
13	Van 't Hogerhuysstraat	5	1	1	<1
14	Van 't Hogerhuysstraat	36	7	4	3
15	Van 't Hogerhuysstraat	33	10	3	5
16	Van 't Hogerhuysstraat	38	11	3	6
17	Van 't Hogerhuysstraat	47	13	2	7
18	Van 't Hogerhuysstraat	53	14	6	6
19	Zwartenhovenbrugstraat	37	9	4	4
20	Zwartenhovenbrugstraat	29	8	2	4
21	Zwartenhovenbrugstraat	45	12	4	6
22	Zwartenhovenbrugstraat	44	24	2	7
23	Saramaccastraat	36	20	2	6
24	Saramaccastraat	16	3	1	14
25	Molenpad	11	3	1	1
26	Molenpad	19	1	1	3
27	Willem Campagnestraat	30	-	1	8
28	Willem Campagnestraat	31	1	9	2
29	Willem Campagnestraat	53	-	2	14
30	Willem Campagnestraat	31	1	9	2
31	Hernhutterstraat	130	5	11	16
32	Slangenhoutstraat	23	1	2	2
33	Slangenhoutstraat	5	1	1	<1
34	Slangenhoutstraat	24	-	1	6
35	Latourweg	76	3	23	4
36	Latourweg	60	-	2	16
37	Jules Wijdenboschbrug	23	1	1	12
38	Jules Wijdenboschbrug	28	1	5	5
	TOTAL	**1,388**	**266**	**130**	**242**

3.1.3. Socioeconomic model

The consultant has handed out the socioeconomic model in an excel file, including the inputs (benefits and CAPEX), as well as the results of the model. This file can be use by the IDB for further analysis.

File name: IDB Suriname_Socioeconomic Model_Final Version.xls