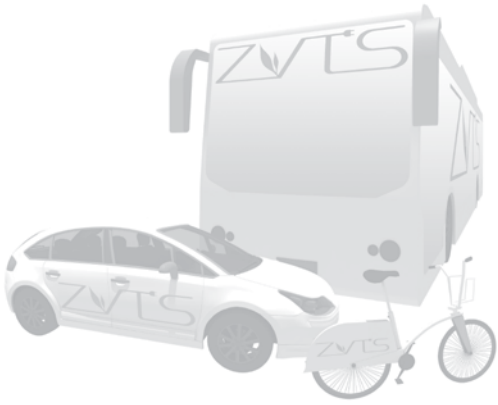
SISTEMAS SUSTENTABLES

Study of a Nationally Appropriate Mitigation Action (NAMA) for Transport

Santiago Transport GreenZone

ZONA VERDE PARA EL TRANSPORTE EN SANTIAGO

Embajada Británica
Santiago



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Acronyms

AChEE:	Agencia Chilena de Eficiencia Energética (by its spanish acronym)
BAU:	Business as usual
CO2:	Carbon Dioxide
FCO:	Foreing on Commonwealth Office
GHG:	Greenhouse Gases
GPS:	Global Positioning System
LDT:	Light Duty Vehicles
MM:	Million (1,000,000)
MRV:	Measurement, Report and Verification
NAMA:	Nationally Appropriate Mitigation Actions
NOx:	Nitrogen Oxides
PM2,5:	Fine Particulate Matter
SECTRA:	Secretaría de Planificación de Transporte (by its spanish acronym)
STGZ:	Santiago Transport Green Zone
UNFCCC:	United Nations Framework Convention on Climate Change
USD:	United States Dollar
ZLEV:	Zero and Low Emission Vehicle
ZV:	Zona Verde (by its spanish acronym)
ZVTS:	Zona Verde para el Transporte en Santiago (by its spanish acronym)

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Introduction

1.1 General background

The Chilean Ministry of Transport and the Ministry of Environment are developing and analysing a number of different NAMAs (Nationally Appropriate Mitigation Actions) within the UNFCCC framework. The aim of these proposals is to help the country reduce it´s GHG emissions, become more economically resilient and develop an infrastructure for a green economy. The Ministry of Transport and the Ministry of Environment have prioritized one NAMA in particular: the Transport Green Zone.

The main objective of this study is to propose a preliminary implementation plan for the Transport Green Zone in Santiago and apply for national and international funds for implementing this Green Zone in the Municipality of Santiago.

The Santiago Metropolitan Region is the most populated area in Chile with close to 38% of Chile's population. The development and implementation of this NAMA will help to reduce the financial barriers that have hindered sustainable projects in the past and potentially create a model for innovative transport policies in Chile.

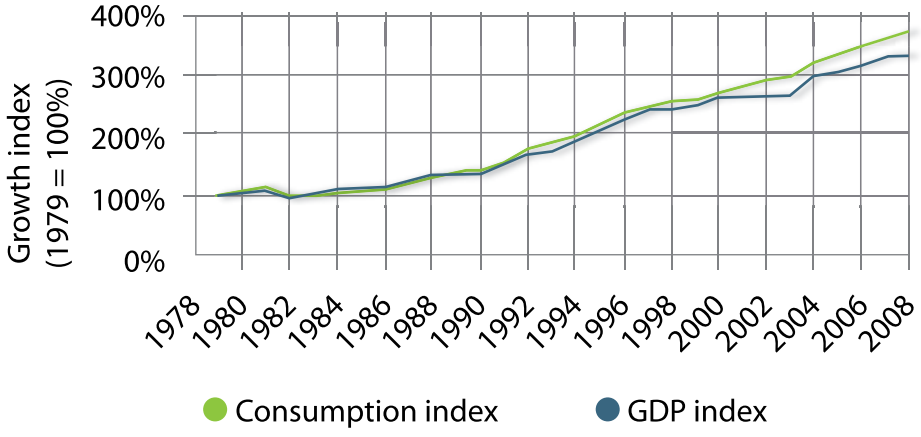
A Transport Green Zone has a vast potential for redefining the urban transport model with a new focus on integrated and sustainable transport. The implementation of this plan would also provide new ways of reducing GHG emissions and local pollutants. The project is highly replicable in other cities and its definition can be expanded beyond the inner city.

The British Embassy in Chile under the Foreign Commonwealth Office has created alliances with the following local entities:

- The Ministry of Environment
- The Ministry of Transport
- The Secretariat for Transport Planning (SECTRA by its Spanish acronym)
- Transantiago (Santiago public transport system)

1.2 The Chilean on-road transport sector

Figure 1.1 Energy demand growth and GDP in Chile, 1978 – 2008.



Source: *Estudio de Bases para la Elaboración de un Plan Nacional de Acción de Eficiencia Energética 2010-2020*

In 2008, Chile imported 68% of the energy consumed with an import of almost 100% of oil. Oil and oil products are the main energy sources in the country and represent 49% of the total energy consumption (Agencia Chilena de Eficiencia Energética, AChEE 2010). Since the transport sector is the main consumer of oil in Chile, it has become highly dependant on national consumption behaviour trends.

Figure 1.1 shows the close relationship between energy consumption and economic growth with energy demand in Chile increasing in parallel to the GDP.

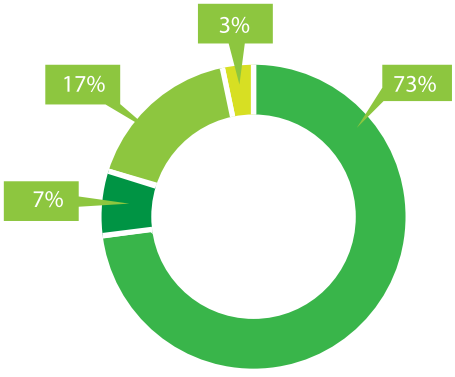
Population is the most relevant variable that correlates to transport. Chile´s current population has reached 17,094,275 inhabitants and the expected population for 2025 is 19,232,989 inhabitants (SECTRA, 2010). Since Chile is a developing country with projected population and economic growth, it is also expected that the transport sector will grow, increasing its participation in energy consumption and, subsequently, in emissions.

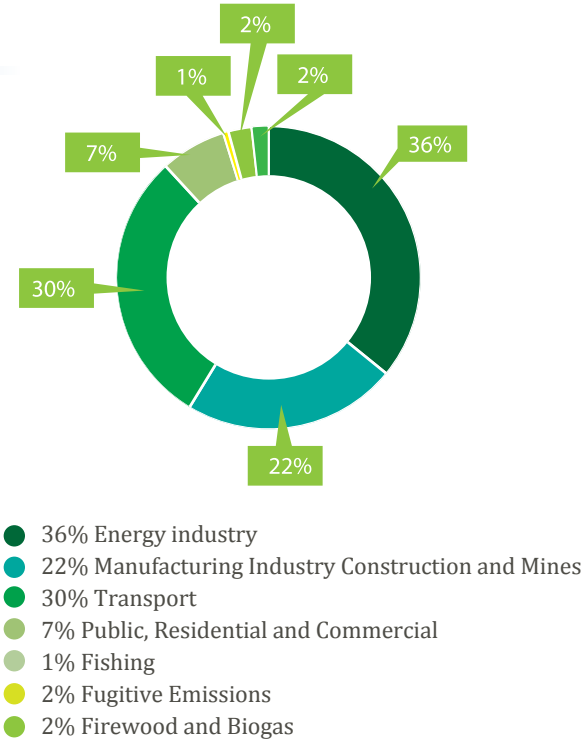
According to estimates by the Central Bank, in 2009 all transport categories represented 5.5% of the total GDP. From this total, national transport trucks have a share of 85% of the total tons transported around the country.

The transport sector includes the subsectors Air Traffic, Shipping Activities, Railways and Road Transport. According to the National Energy Balance Report 2008, the subsector road transport is responsible for 68.1% of the total consumption of the sector, Shipping Activities 22.2%, Air Traffic 9.4% and Railways 0.3%.

From the last National Communication under the UN Framework Convention on Climate Change in 2006 (see figure below), CO2 emissions in Chile were 79,057 Gg CO2eq, of which transport accounted for 21.5% (17,062 Gg CO2eq), being the second subsector after electricity generation with 26.2% (20,751 Gg CO2eq). Per capita emissions are still below those of industrialized countries but above most countries in the Latin American region.

Figure 1.2 Total CO_2eq emissions for Chile (left), energy distribution by sector (right)

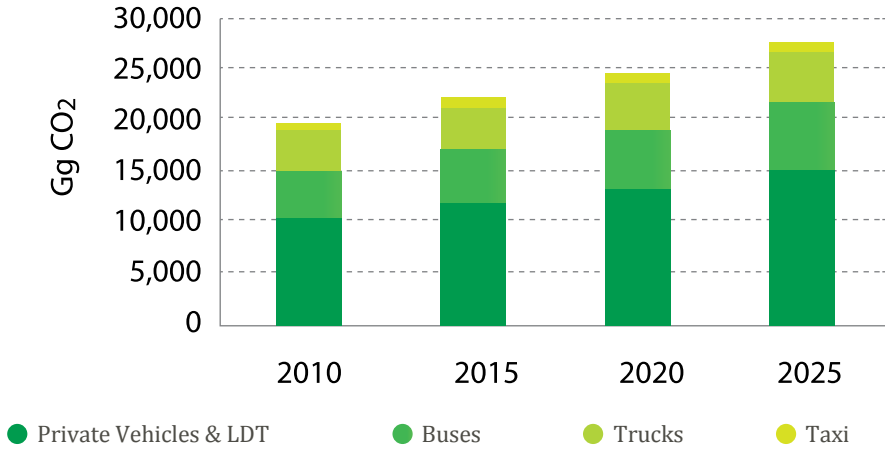




Source: *2nd National Communication under the UN Framework Convention on Climate Change Ministry of Environment (published on august 2011).*

Projections in 2006 for the transport sector show that in a Business as Usual (BAU) scenario, emissions will increase by 40% between 2010 and 2020 (see Figure 1.3). This will amount to 25,000 Gg CO2eq/year in 2020. The road transport subsector represents more than 90% of all transport emissions with private vehicles contributing 54% by 2010 and 56% by 2020 (see figure 1.3).

Figure 1.3 Projections of CO2 emissions for on-road transport



Source: *Second National Communication under the UN Framework Convention on Climate Change Ministry of Environment (published on august 2011).*

Clearly, the road transport sector is mainly responsible for fossil fuel consumption and GHG emissions in Chile. A geographical split suggests that the Metropolitan Region has the largest share of CO2 emissions with 37%, followed by the VIII Region with 11% and the V Region with 10%.

1.3 Scope

Sistemas Sustentables has adjudged the project "Study of a Nationally Appropriate Mitigation Actions (NAMA) for Transportation Sector: Santiago Transport Green Zone" for the Embassy of United Kingdom (UK) represented by the Foreign Commonwealth Office (FCO).

The objective of this study is to facilitate the implementation of a Transport Green Zone in Santiago, Chile, considering the high priority placed on this NAMA by the Government of Chile and its potential for contributing to the country´s voluntary international commitment to take actions that will result in a 20% deviation from business-as-usual emissions by 2020.

The main initiatives to be launched in the proposed Transport Green Zone are related to promoting clean and energy efficient buses for public transport, non-motorized vehicle use, traffic re-design and traffic management and the use of zero emission vehicles and low emission vehicles.

In order to achieve the main objective of this project the following three main activities have being carried out:

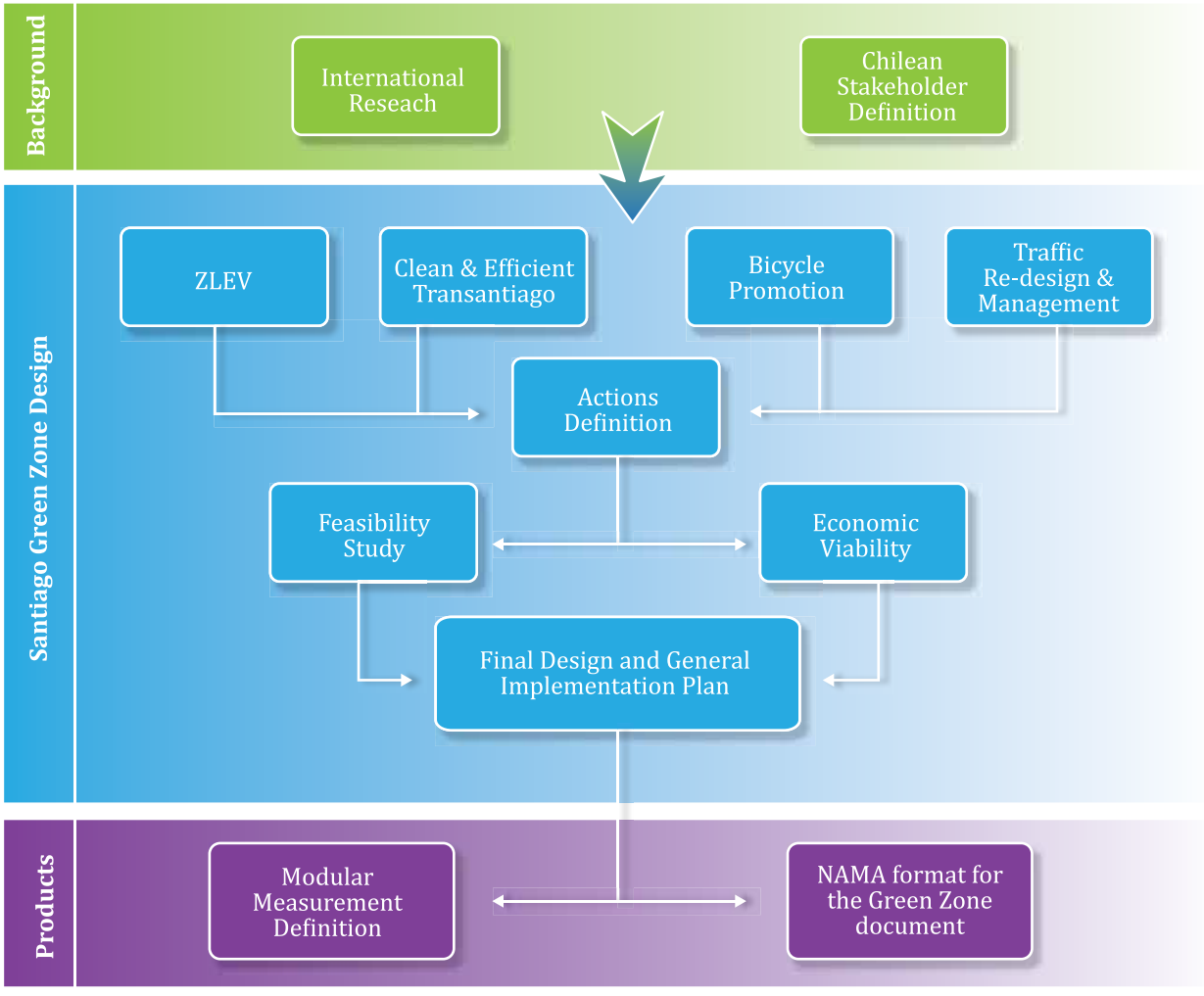
1) Definition of actions to be included in the evaluation: Each of the initiatives mentioned above included a set of actions that were selected after concluding two main activities:

a. Research on relevant international experience.
b. Workshops and round tables with relevant Chilean stakeholders
(NGOs, academics, public and private agencies, etc.) to discuss potential activities to be implemented.

2) Technical and economic feasibility Study: Once the initiatives were defined, a feasibility study was conducted to estimate the environmental (GHG and criteria pollutants) impact and define a cost efficient index in terms of CO2 cost reduction. A cost benefit analysis of the project was also carried out.

3) Concept Notes: A concept note for each initiative was written within the policy framework of the Ministry of Environment in Chile. Each concept note includes the technical and economic analysis and an implementation plan for each initiative and their main activities.

Figure 1.4 Methodological approach for Santiago Transport Green Zone design



2. *Santiago Transport Green Zone*

The STGZ should be implemented with the launching of four initiatives, listed below and explained in more detail further in this chapter.

Promotion of ZLEV (Zero and Low Emission Vehicles)

I. Free parking for ZLEV vehicles
II. Promotion of ZLEV Taxis inside the STGZ
III. Promotion of ZLEV for the Municipality fleet

Clean and energy efficient public transport buses

I. Replacement of standard buses with low carbon technology buses
II. Charging station incentive mechanism

Promotion of non-motorized vehicle use

I. Design of bicycle ways and bicycle signs
II. Bicycle sharing program
III. Commercial activities using non-motorized vehicles

Traffic re-designs and traffic management

I. Bicycle parking infrastructure integrated with public transport
II. Exclusive ways for buses of Transantiago
III. Better sidewalks and public spaces for pedestrians

The proposal of a geographic perimeter for the Transport Green Zone in Santiago was defined in conjunction with the Municipality of Santiago. The definition considers the Historical Centre Triangle of the city and covers about two square kilometres. The following streets delimit the Centre Triangle (see Figure 2.1):

Pío Nono Street (east)
Manuel Rodríguez Street (west)
Santa María (north)
Av. Libertador Bernardo O'Higgins (south)

The Santiago Transport Green Zone (STGZ) will be located in the heart of the city and this territory belongs to the Municipality of Santiago. Many of the historical places of the city can be found inside STGZ, such as the Main Square "Plaza de Armas", Santiago's Cathedral, the Government Palace "La Moneda", the Municipal Theatre, the Central Market and a central park called Parque Forestal, among others.

The selected area is a very popular, touristic and commercial area as mentioned before, which ensures high visibility for all the STGZ initiatives, which is specially important for local citizens and for creating a green and sustainable image of the city for tourism.

Figure 2.1 Geographical limits of the Santiago Transport Green Zone

- Public Bicycle Stations
- Low Emission Buses
- Low Emission Pilot (line 202)
- Cycle ways
- Pedestrianization
- Underground Parking (in study)
- Underground Parking (available)
- Charging Points Proposal

2.1 Promotion of ZLEV (zero and low emission vehicles)

The Chilean Government is promoting the use of Zero and Low Emissions Vehicles in an effort to improve the rate of emissions from local vehicles. ZLEV have several advantages, being one of the most relevant -especially in the case of Electric Vehicles (or Grid Enabled Vehicles)- that the source of emissions is separated from the vehicle, providing substantial reductions in the user´s exposure to emissions. Additionally, by connecting the vehicles to the grid, several sources of energy can be used from coal to renewable. Production of energy at a large scale is more efficient, which adds value to the use of these cars together with the reduction of emissions per unit of energy produced. It is strategically relevant that the energy matrix is diversified since Chile doesn't produce oil and has a huge renewable energy potential.

This initiative seeks to promote ZLEVs for commercial fleets and taxis, beginning with a pilot under the STGZ project. The actions to promote inside the STGZ design are listed below:

I. Free parking for ZLEV vehicles
II. Promotion of ZLEV taxis within the STGZ
III. Promotion of ZLEV for the Municipality fleet

Figure 2.2 Electric vehicle charging station at Chilectra's facilities in Santiago (left), electric car currently available in Chile (right)

Proposal Design

The main objective of this initiative is to build incentives for a practical use of ZLEVs, in particular electric vehicles, which are currently available in the Chilean Market. Electric vehicles have a high emission reduction potential both for GHG emissions and local emissions.

Free/Low price parking for ZLEVs: This considers the instalment of one or more charging poles in public parking spaces. There are several underground parking facilities on the STGZ, which are controlled by concessionaries. These concessionaries are willing to include in their services free or low price parking space for ZLEVs and an electrical charging station that will encourage the use of ZLEV (Electric vehicles). This will be implemented alongside the Integrated Bicycle Parking Infrastructure initiative (see section 3.4) for bicycle parking in underground parking facilities. The parking services will be located next to each other.

Promotion of ZLEV Taxis within the STGZ: This action consists on the transformation of 4 regular taxi stations inside the STGZ to electric taxi stations. Each station will park 10 Taxis. E-Taxis will have a different image than regular taxis and will be able to circulate without restrictions in the STGZ.

Promotion of ZLEV for the municipality fleet: 10 vehicles from the Municipality Fleet will be replaced by Electric Vehicles; the main objective is that the authorities behave as role models in the use of clean technologies.

Conclusions and Recommendations:

- If the average use is 50,000 kilometres a year, there will be a 32 USD/ton reduction of CO2 emissions by Electric Vehicles.
- Hybrids and Full EVs have clear co-benefits in relation to the reduction of local pollutants and noise pollution, both important issues in the STGZ.
- Although the STGZ restricts the circulation of taxis that do not carry passengers, this norm is not currently enforced. This could be considered a preliminary measure to build incentives. The use of ZLEV vehicles could also be added as a requirement for circulating in the zone.
- A possible Taxi station to be implemented can be located on the Entrance of the Hotel Galerias, which have a constant movement of Taxis (Executive Taxis), and have designated space for them already. Hotel Galerias is working with Chilectra in order to turn his building into a Green Building.

Figure 2.3 Exclusive taxi station in front of Hotel Galerias

Figure 2.4 Hybrid bus on the streets of Santiago

2.2 Low carbon buses for public transport

Transantiago is the public transport bus system that coordinates all the services in Santiago city. With 6,180 buses operated by 5 companies, the daily operation of Transantiago provides a total of 4.5 million trips per day.

Considering that the Santiago Transport Green Zone is a small area inside the city (2 square kilometres) there is no need to have a special bus service within it. In the current system there are 34 services that cross the Zone operated by 5 main companies, thus if in the future a restriction of any kind is held it will affect the entire system.

Instead, the Santiago's Transport Green Zone can serve as a Pilot Project for buses companies; using a service that will traverse the Zone but will be short enough to show visible changes and it will serve as a "living laboratory" to reduce technology barriers.

Since 2007 Transantiago continuously monitors its fleet, with online tracking (GPS) and has standard levels of maintenance. This makes Transantiago an excellent candidate for a NAMA, where measurement, reporting and verification (MRV) are essential.

Proposal Design

The proposal design of this initiative is to start a Pilot Program with 5 Full Electric buses and 5 Hybrid buses, in order to analize technological behaviour under real conditions of the city. In addition the impact on the population can be evaluated, this action works in conjunction with the action "Exclusive Ways for Buses of Transantiago" described in more detail in section 3.4.

Conclusions and Recommendations:

- The results obtained show that the maintenance costs are relevant, but in Diesel Hybrid-Electric and Full Electric technologies these costs have a high uncertainty.
- Manufacturers are expected to offer a hybrid business model that reduces the level of uncertainty of the battery life. This would have a high initial cost; however, with the advances in technology, the cost should decline.
- Financial contribution could be focus in reducing uncertainty in maintenance costs for these new technologies, which is considered an entry barrier to this business. The initial investment today is not as relevant to decision-making, but maintenance costs are.
- It is recommendable to fund a pilot project with 10 buses, to help reduce uncertainty in this area and give more confidence to potential operators.

2.3 Promotion of bicycle use

The Bicycle mode will be included in the Santiago Transport Green Zone (STGZ) design as a sustainable transport mode. The improvement of bicycle use will be developed closely with the Municipality of Santiago, to take advantage of their actual infrastructure and their strategic planning.

Santiago is an extensive city that requires modal integration between bicycles and other efficient modes like public transport. The STGZ proposes the assessment of three actions to integrate bicycles as a transport mode:

I. Design of bicycle ways and bicycle signs
II. Bicycle sharing program
III. Commercial activities using non-motorized vehicles

The Bicycle mode is one of the most efficient ways of transportation for short distances. For trips up to 5 kilometres long, cycling is better than walking, using public buses, underground and passenger cars (see Figure 2.5). In a 10-minute ride, people can cover 3.2 (km) which means that bicycle users would have a range area of 32 (km2), as shown on Table 2.1.

On the other hand, STGZ covers about 2 (km^2) and therefore, bicycle mode should be a better way for travelling inside of it. This initiative is a good chance for testing different alternatives to use bicycle as a transport mode and also, collect real and local data that allow evaluating this kind of initiatives in other cities of Chile.

Additionally, bicycle promotion will bring many co-benefits such as less local pollution, less noise pollution, less congestion, greater appreciation of public spaces and better accessibility, among others.

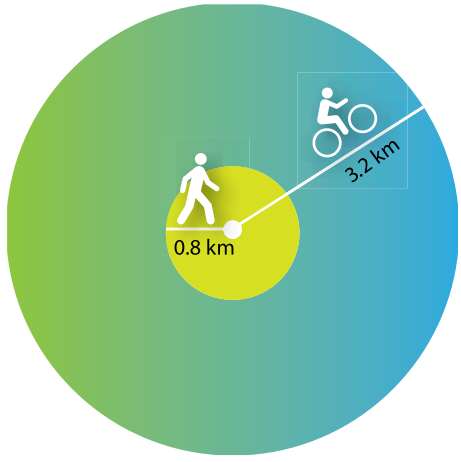
The following subsections describe the three actions for implementing this initiative and the results of the technical and economic assessment.

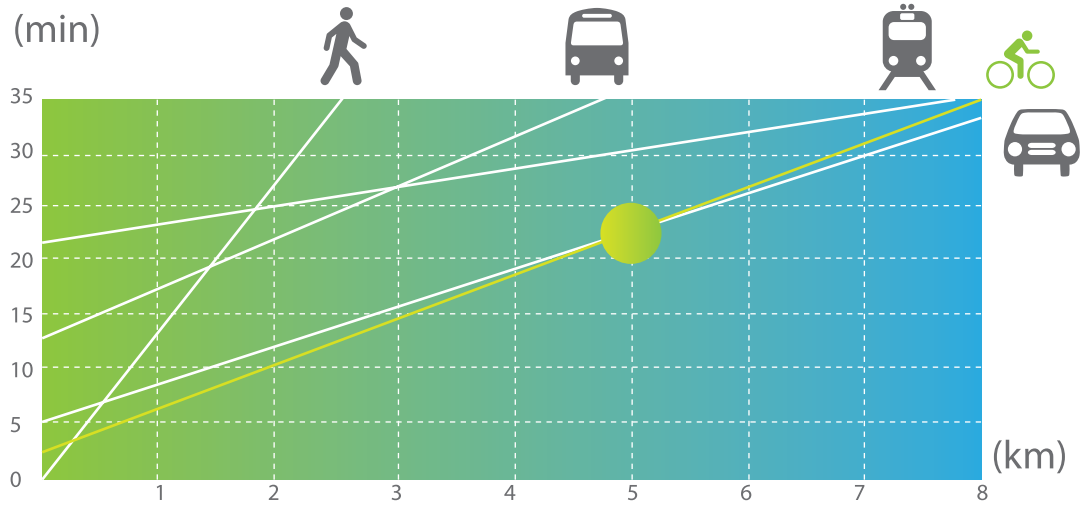
Table 2.1 Distance in 10 minutes by pedestrian and bicycle modes

Mode	Average Speed (km/h)	Distance in 10 minutes (km)	Range Area (km_2)
Pedestrian	5	0.8	2
Bicycle	20	3.2	32

Source: "Cities for Bicycles, Cities for the Future", European Commission

Figure 2.5 Bicycle range and time taken for short distances trips





Source: "Cities for Bicycles, Cities for the Future", European Commission

2.3.1 Design of bicycle ways and bicycle signs

The Municipality of Santiago has around 25 km of bicycle ways across its territory and two bicycle ways within the STGZ. One bicycle way is in the northern limit of the STGZ through the Parque Forestal and ending in the main square of Santiago, called Plaza de Armas. The other bicycle way runs along the southern limit, following Av. Libertador Bernardo O'Higgins (or Alameda) on a bicycle path built in the middle of the avenue.

Proposal Design

Two bicycle ways are proposed for the STGZ: one in a North-South direction and another in an East-West direction. Both would be bidirectional and 2.5 m wide. This proposal follows the Urban Plan that Municipality of Santiago is currently developing.

The areas selected (blue circle in Figure 2.7) for including special bicycle signs are called Lastarria town and Monjitas town. These areas have a high circulation of bicycles and will be enhanced by this action.

Figure 2.7 shows the two bicycle ways proposed and the area selected for free bicycle riding including special signs. Table 2.2 shows this proposal in detail.

Figure 2.6 Bicycle ways and bicycle signs proposal

The Municipality of Santiago approved these two bicycle ways and the need for connection points that could be developed in a future stage was taken into account. The details of how to connect the four end-points have not been developed in this proposal, as this study is a feasibility study. However, the four end-points of the bicycle ways proposal are next or close to existing bicycles ways that can be connected. In the northern point there is a bicycle way in "Los Reyes" Park, in the southern point there are two bicycle ways: Alameda Av. and Bulnes St., in the eastern point there is a bicycle way in Parque Forestal and finally, in the western point there is a bicycle way in Huérfanos St. This existing infrastructure should be taken into account for a detailed design of a bicycle ways proposal to achieve an appropriate connection.

Table 2.2 Bicycle ways and bicycle intervened area details

Location	Comments
Morandé Street	From *Av. Libertador Bernardo O'Higgins* to *Presidente Balmaceda St.* North-South direction 1.3 km long Bidirectional 2.5 m wide Connection with current bicycle way in the southern point
Catedral Street	From *Av. Manuel Rodríguez* to *José Miguel de la Barra* St. East-West direction 1.5 km long Bidirectional 2.5 m wide Connection with actual bicycle way in the eastern point

2.3.2 Bicycle sharing program

The bicycle-sharing program, the bicycle-sharing program is a transport system that has been implemented in many important cities in Europe with excellent results in terms of user demand. In 2009 there were 55 bicycles public programs implemented in Europe, America and Asia. One of these programmes has been implemented in Chile by the Municipality of Providencia from 2008. It started with 150 bicycles and 15 stations around the commune (Figure 2.7). Today, Providencia's bicycle program has 180 bicycles and 18 stations and has a manual control system.

Figure 2.7 Bicycle sharing in Providencia, Santiago

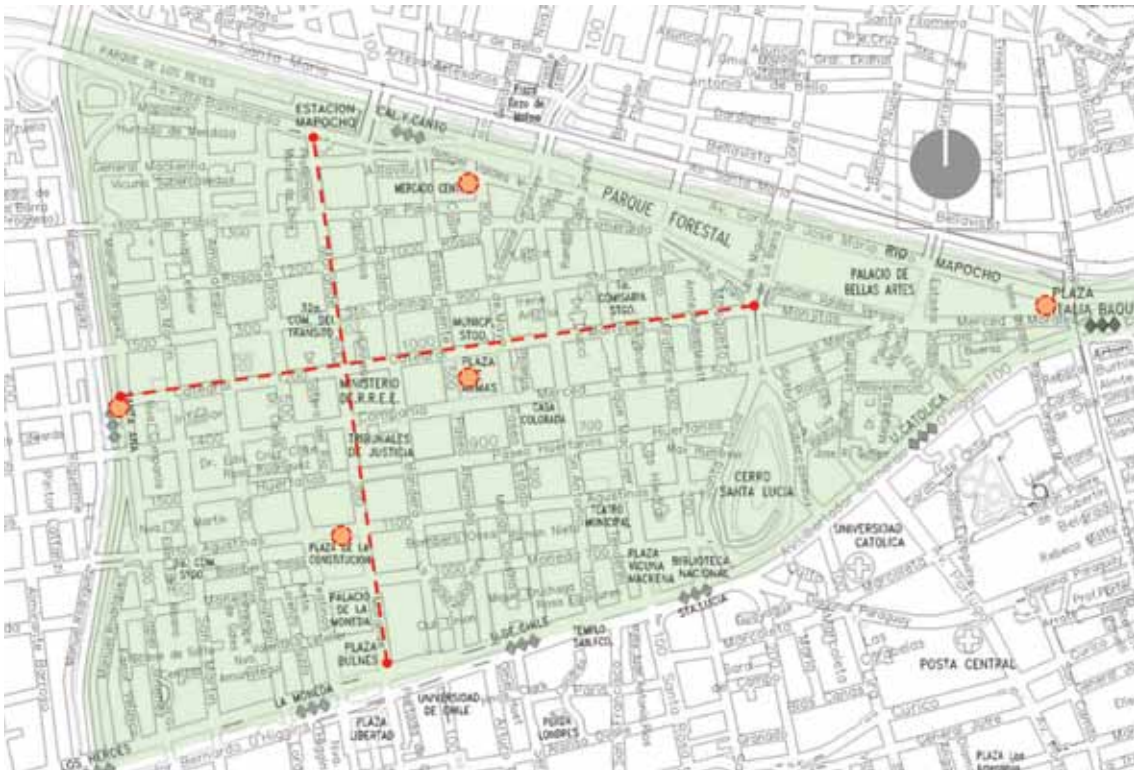
Proposal Design

A bicycle-sharing program is proposed to encourage bicycle use inside the STGZ. This pilot plan will include 50 bicycles and 5 stations and would be based on Providencia's bicycle program. Figure 2.8 shows the stations points within the Transport Green Zone, located in very popular and touristic areas of Santiago. Table 2.3 shows details for each station point that will be included in the bicycle-sharing program.

Table 2.3 Bicycle station points

Station	Comments
Ciudadanía Square	Station located in front of Government house. A safe and very popular place
Plaza de Armas	Station located in a very popular place because this is the main square of the city
Central Market	Station located in a very popular and touristic place
Santa Ana Square	Station located in a popular square, in the western limit of the STGZ
Parque Forestal	This is the eastern limit of the municipality of Santiago, which limits with the Municipality of Providencia, making it possible to shift to the Providencia Bicycle system, with a station located at less than 200m

Figure 2.8 Bicycle sharing proposal



2.3.3 Commercial activities using non-motorized vehicles

This action is mainly related to delivery activities normally carried out in motorbikes. The STGZ is located in Santiago city centre, which is a busy area, with a lot of commercial activities such as restaurants, post offices and grocery shops. Also, this area has high level of congestion and streets are narrow, so businesses prefer to use motorbikes to deliver different goods around this area.

Today there are many shops in Santiago city that are including bicycles for delivering activities and the proposal for this action is to replicate this experience inside the STGZ.

Proposal Design

A pilot plan for non-motorized delivery activities involves the replacement of 200 motorbikes from different commercial businesses. STGZ is a flat area and therefore it shouldn't be difficult to deliver goods in the area. Figure 2.9 shows 2 examples of non-motorized cargo vehicles that can be used in this action.

Figure 2.9. Examples of non-motorized cargo vehicles

2.4 Traffic re-design and traffic management

Since the Santiago's Transport Green Zone (STGZ) was defined as a territory inside the Municipality of Santiago, it is very important to synchronize with their local plans. While talking with the local stakeholders, it was possible to find out that they were fully oriented to concrete most of the actions following the recommendations of a Strategic Study named "Design and Evaluation of Accessibility and Mobility Actions to Recover the Central Area of Santiago". The Global Environmental Facility financed the study; it was conducted by the Ministry of Transport and ended in 2007.

At present, many of the actions considered in that study have been implemented. Therefore, the present study recommends actions that will improve the existing ones or will complement them.

As a result, the selected actions for this initiative are the following:

I. Integrated bicycle parking infrastructure
II. Exclusive ways for buses of Transantiago
III. Better sidewalks and public spaces for pedestrians

2.4.1 Integrated bicycle parking infrastructure

The Municipality of Santiago has been a pioneer in planning and building underground car parking places in the city centre and its perimeters. It has used normative instruments to attract private investment and stimulate commerce in specific areas in the city centre.

There has been a very interesting evolution since the very first concessions. At first, the most important goal was to succeeded and get at least one concessionary. Once significant interest was shown and there were important opportunities to benefit from concessions, the Municipality of Santiago started to use these kinds of projects to recover its urban area. Today, the Municipality has gone a step further: it has not only succeeded in creating many private concessions that are profitable and become an important urban recovery icon, but has also gained the faculty to concession complementary services such as stores and restaurants, which are also beneficial in economical terms for the Municipality.

There are eight projects already operating and two under study. Figure 2.10 shows the underground services that are already operating and also those that will be concessioned soon.

Figure 2.10 Location and description of car parking services inside the Transport Green Zone

Underground Parking Service Operating

Undergrund Parking Service in Study Process

Flat Green Area

Pedestrian Street

Bicycle Path

1 Parque Forestal (304)

2 Plaza de Armas (402)

3 Plaza de la Justicia Montt - Varas (420)

4 Santa Lucía (504)

5 Plaza Mekis (452)

6 Plaza de la Ciudadanía (557)

7 Plaza Bulnes (376)

8 Santa Rosa (302)

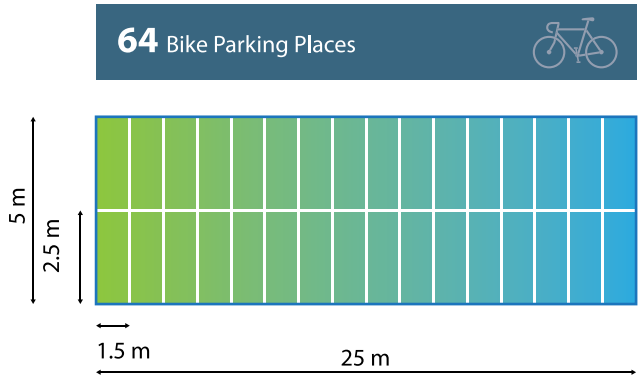
This action proposal would take advantage of the infrastructure and experience available and find ways to provide bicycle parking lots inside the parking places that already exist. This project complements the local strategic plan as it adheres to the same general objectives.

Proposal Design

There are two possible situations. The first one is related to the underground public parking services concessioned by the Municipality of Santiago which are already operating, and the second action is related to those still under study.

The proposal is the implementation of a pilot project which considers the rental of 10 car parking places per each existing parking service for the whole of the concession period. Most of these places can make space for an area of 25 meters long, 5 meters wide and its capacity would be enough to park at least 64 bicycles (see Figure 2.11).

Figure 2.11 Bicycles parking proposal



Not all the parking services are always full; it then makes good business sense for most of the eight existing services to agree to a permanent rental contract for a number of places representing between 2% and 3% of their offer. This project will have cero impact on their services to car drivers but will be a great opportunity for cyclists to cycle to the city centre. Since these private operators have relevant know-how in security, service quality, procedures and parking standards, they represent a big opportunity for bike riders.

It is important to note that in 2011, a private investor applied for a concession of a parking service in the Municipality of Providencia, right by the main entrance of the Metropolitan Park. The relevance of this offer to the STGZ project is that the private investor also offers bike-parking places. Likewise, the Municipality of Providencia also launched a concessioned parking service 2 years ago with a number of bicycle parking lots. It is then a reality that a new type of project is needed in which operators must have in mind this new sustainable type of service.

2.4.2 Exclusive ways for buses of Transantiago

The STGZ concentrates all kinds of different urban activities, such us commerce, financing, public and private services, etc., which explains the reason why it is a main attraction to travel to the centre of the city including all kinds of travel modes. This situation is the explanation of the great offer of public transport in all direction that serves and cross this area. The system name is Transantiago.

Currently, the public transport system operates with bus stops with an average distance of 3 to 4 streets between each one. However, there are a few streets that concentrate a great amount of urban activities but have no bus lines offer, such as Teatinos Street. The reason for this decision comes from a central and local policy to eliminate these kinds of transport services, with conventional buses, because they are considered as not feasible for this area due their negative externalities (emissions, noise, and congestion) and also taking in consideration that the offer in avenues closer to the city centre has been improved.

Under this action, the recommendation is to get only one special service back to Teatinos Street with zero emission and noise free bus service.

One of the advantages of choosing this street is because it is easy to adapt bus services from existing operators that would agree to introduce some new buses from their fleet that have low or zero emissions on a different trajectory. This street is very close to commerce, financing, public and private services, from pedestrian streets and is next to the Government Palace of Chile called “La Moneda”.

This service should provide bus stops more related with user needs and special facilities for older and disabled people. This project is a complement to the local strategic plan, because it was not considered on it but runs under the same general objectives.

Specifically, the action considers the implementation of an extra bus route related with the Service 202 of Transantiago, which is an existing service operated by Subus Chile Company. Service 202 crosses the Transport Green Zone in North-South direction and the total travel length is 22 (km) approximately.

Figure 2.12 Existing service and proposal for 202 bus route trajectory

Existing 202 Bus Service Additional 202 Bus Service

Proposal Design

The action considers that 10 buses from Line 202 will change their route from San Martín St. -San Ignacio St. to Teatinos St.- to Nataniel St. as shown in Figure 2.12.

There are three possible ways to implement this proposal. The first would be adapting existing contracts giving the operators the possibility to evaluate a service extension. The second would be to incorporate this proposal as a new service and a third possibility would be to include this service in future contracts, alongside others.

It is important that this project takes advantage of this opportunity to eliminate barriers that prevent authorities and private investors incorporating this kind of technology. One of the main reasons because these kinds of investments are so hard to implement is due to the uncertainties surrounding its operational costs. Therefore,

this action would use the NAMA instrument to implement, monitor and evaluate real and local data to help take better-informed decisions in the future.

The company Subus Chile is one of the main operators of Transantiago with a fleet of 981 Euro III buses, travelling each day 235,000 (km) and carrying every day more than 600,000 users in 45 routes. The big bus transport concession renewal will be in 2018, however it is expected that this action could be implemented using the current contracts, or negotiating small adjustments to these contracts.

Section 3.2 on the Low Carbon Emission for Public Transport Buses initiative shows the emission reductions and economic evaluation for this pilot for Lane 202 of Transantiago.

By introducing buses with low emissions there are important social benefits related with positive externalities to the environment because it is possible to eliminate conventional buses. But from the operator point of view, the demand of passengers in these special streets should be greater.

2.4.3 Better sidewalks and public spaces for pedestrians

One of the key attributes that STGZ should have is an excellent pedestrian accessibility. There should be plenty of ways to give people good mobility in all directions, harmonizing it with the own activities of the area. For this reason this action proposal would improve this feature in Moneda Street, from Manuel Rodriguez Street to Santa Lucía Street, located in the heart of the STGZ.

The main aim of this NAMA is to improve the operational condition for pedestrians, incrementing the walking area and reducing friction between motorized vehicles and pedestrians in 15 blocks along Moneda Street.

Proposal Design

This street has a significant flow of pedestrians, due to the high commercial and service sector activity in the area. Furthermore, there are vehicles that circulate on Moneda St which have loading and unloading activities, leading to conflict between pedestrians and vehicles.

Currently there are two lanes for vehicles over approximately 8 meters. The proposal considers the following 3 sections (see Figure 2.13 and Figure 2.14):

- **Section 1:** from Santa Lucía Street to Mac Iver Street, like a full pedestrian street, allowing the access to properties.
- **Section 2:** from Mac Iver Street to Teatinos Street, like a semi-pedestrian street. In this case the proposal is to create one 5 meters wide lane, incrementing the walking area by around 3 meters, improving pedestrian conditions and favouring trading conditions in the area.
- **Section 3:** Teatinos Street to Manuel Rodríguez Street would be full-time pedestrian streets that allow access to properties.

This project is part of the local strategic plan and it was selected as part of the priority list in the study “Design and Evaluation of Accessibility and Mobility Actions to Recover the Central Area of Santiago”.

Figure 2.13 Pedestrian facilities proposal for Moneda Street

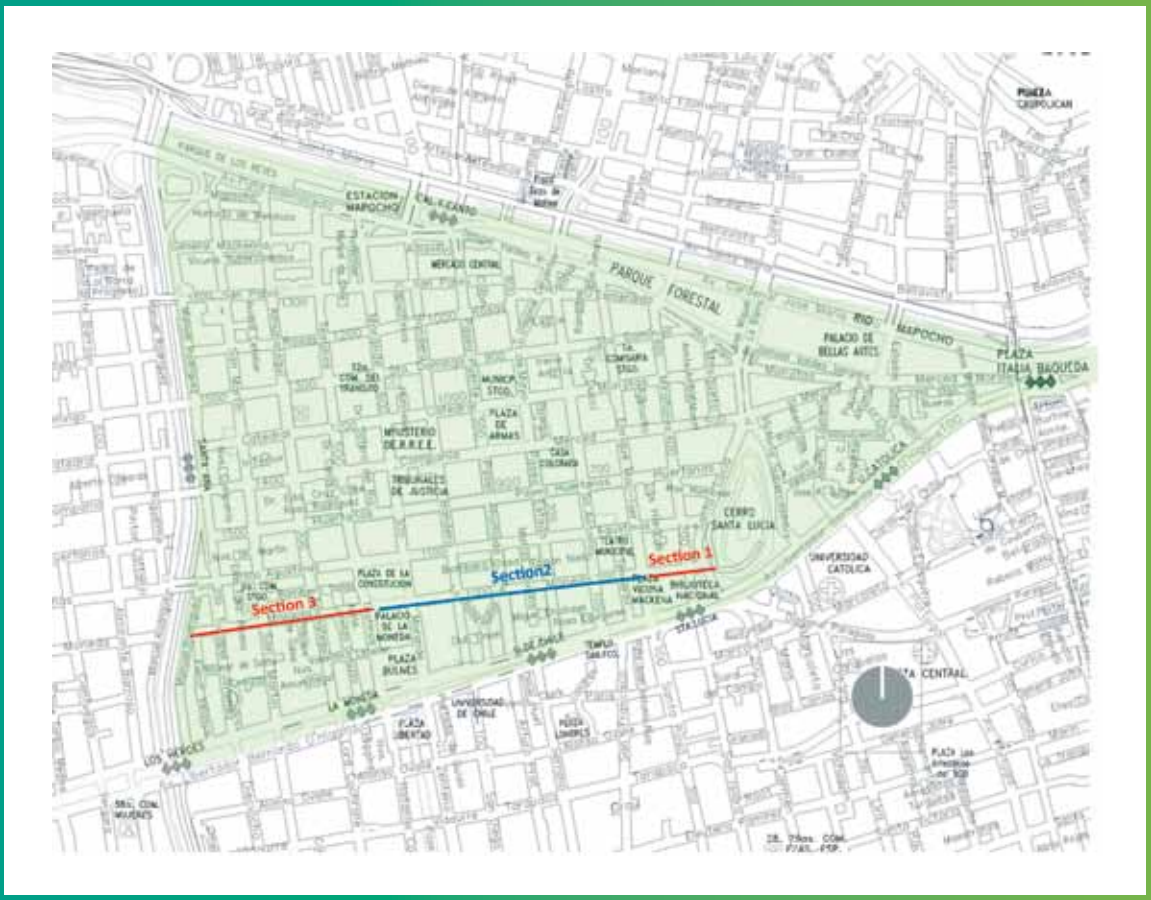


Figure 2.14 Example of semi-pedestrian street

2.5 Corporate image development

STGZ should include a Corporate Image Development in order to promote and communicate to citizens all the initiatives that will be implemented in the area, as they will have high visibility inside the STGZ with new green infrastructure for transportation giving the signal to people and paving the way for future behavioural changes.

This Corporate Image should be an icon representing the STGZ, in electric and hybrid buses, electric taxis, charger points, bicycle sharing system, underground bicycle parking, etc.

In this context, Sistemas Sustentables developed a proposal of a corporate image for the STGZ, which includes a logo design, 3D images for the different vehicles (electric vehicles, bicycles and buses), and one 3D image that represents how the city would look like in a future implementation stage.

Santiago's Transport Green Zone is represented by the Spanish acronym "ZVTS" (Zona Verde para el Transporte en Santiago) which is the concept used to develop a corporate image. Figure 2.15 shows the proposed logo for the STGZ communicational campaign.

Figure 2.15 Logo proposal for Santiago's Transport Green Zone (ZVTS for its spanish acronym)

Figure 2.15 represents the original idea of implementing a special area where it is possible to experiment sustainable transport. However, this logo can be perfectly adapted if the STGZ starts to include other activities and pilots plans that are different from transport initiatives, such as recycling, renewable energy sources, etc. In this case, the STGZ would be better represented only by the concept "Green" and the icon that initially "ZVTS" bore the letters (Figure 2.15) could be adapted to the acronym "ZV" (Zona Verde or Green Zone) as shown in Figure 2.16.

Figure 2.16 Green Zone (Zona Verde in Spanish) logo proposal

Also, in the case that the STGZ becomes a successful experience, it can be replicated in other cities and, once again, the original logo can be adapted by changing the last letter, representing the first letter of the zone (in this case Santiago commune) similar to the initial icon, as is shown in Figure 2.17

Figure 2.17 Transport Green Zone (Zona Verde para el Transporte or Green Transport Zone) logo proposal

Once the STGZ is defined with the logo shown in Figure 2.15, different elements that belong to the four initiatives considered in this study should be intervened with it in order to extend the concept of Sustainable Transport inside the STGZ. The following figures perform 3 key elements that would be present in the STGZ proposal.

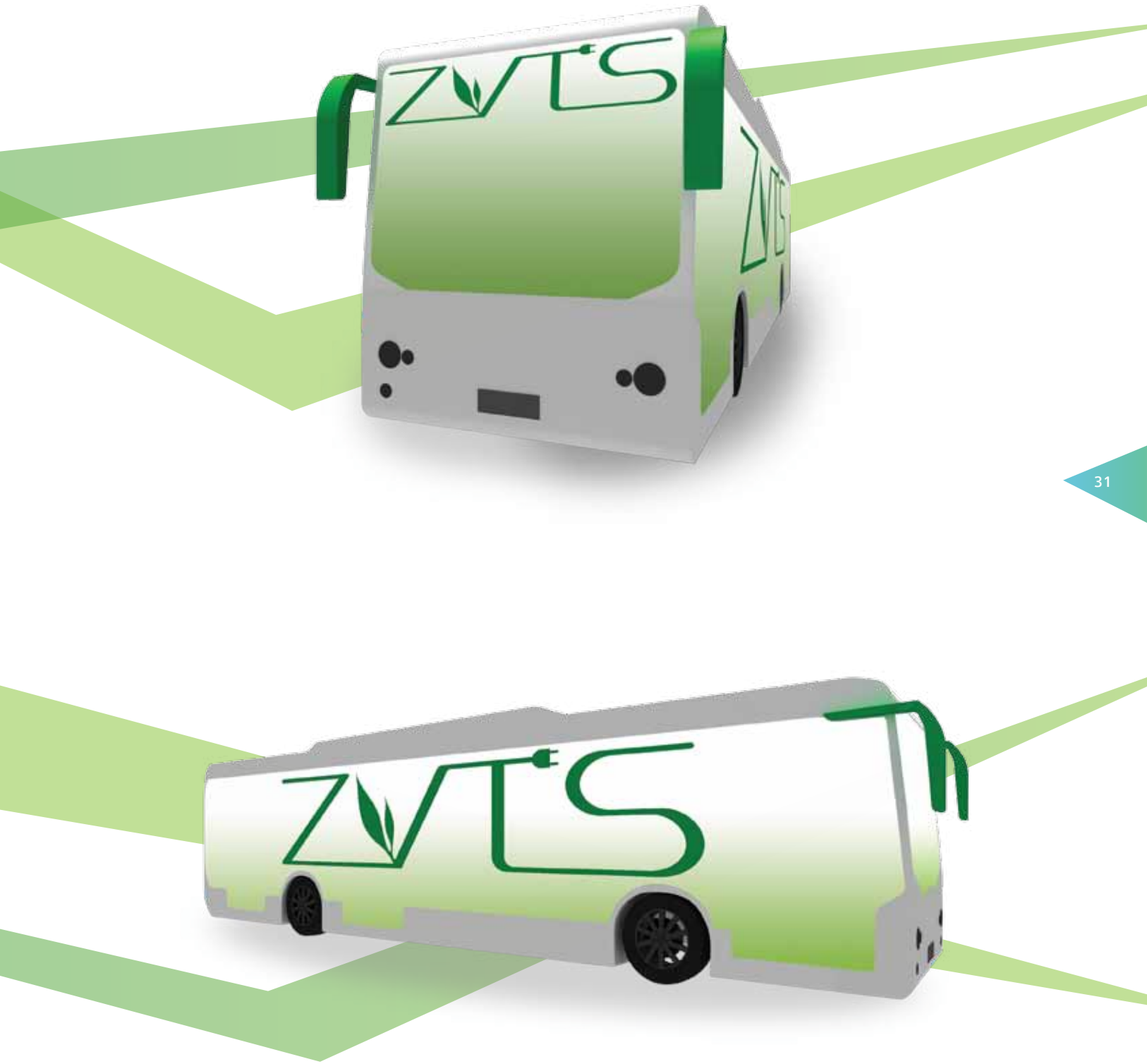
Figure 2.18 Street sign announcing a charging station for ZLEVs

Figure 2.19 Example of underground parking sign for the integrated bicycle parking initiative

Figure 2.20 Example of electric vehicle for the ZLEV initiative

Figure 2.21 Example of bicycle for the bicycle sharing program

Figure 2.22 Example of electric/hybrid bus for the low carbon buses initiative



Finally, Figures 2.23 and 2.24 are 3D images for Teatinos and Morande streets, next to the Government Palace "La Moneda". These pictures are examples of how the city would look like once the STGZ is implemented.

Figure 2.23 Example of Teatinos Street with all the ZVTS's elements

Figure 2.24 Example of Morandé Street with charging station, electric taxis and cycleway

3.

General Implementation Plan

The present chapter includes the General Implementation Plan for Santiago Transport Green Zone (STGZ), which is separated in 4 modular plans for each initiative described in Chapter 2 and described in the following sections.

The modular planning will help to identify the specific stakeholders and funds required for implementing each initiative. Also, the MRV (measurement, report and verification) for emission reduction are different in each case.

The general time scale for implementing and evaluating the whole NAMA would be 2.5 years as is shown in Table 3.1, Stage 3 and its cost would be 17.7 MM USD, where local stakeholders will finance 5.1 MM USD (30% of total NAMA cost, approximately).

Table 3.1 General time scale, STGZ

STAGE	ITEM	Description	2011 1st T	2011 2nd T	2012 1st T	2012 2nd T	2013 1st T	2013 2nd T	2014 1st T	2014 2nd T
STAGE 1: STGZ Proposal	1.1	STGZ definition, pre-design and feasibility study								
STAGE 2: Financing	2.1	Application process for implementation funds (national and international)								
	2.2	Approval process for international funds								
STAGE 3: Implementation and Monitoring	3.1	Zero and Low Emission Vehicles								
	3.2	Transantiago, renewal of fleets								
	3.3	Transantiago Pilot								
	3.4	Bicycle mode actions								
	3.5	Better public spaces for pedestrian								

3.1 ZLEV General plan

The general activity schedule for implementing the initiative "Promotion of Zero and Low Emission Vehicles" in the STGZ is shown in Table 3.2.

The two first activities will be the purchase of electric vehicles and the implementation of chargers during the first 6 months of the schedule.

After this, technology transfer related to maintenance and training activities for bus operators should start 6 months before the pilot. In parallel, communicational activities focused on citizens are planned to inform people of the benefits of this new technology.

Finally, the MRV process will be implemented over a period of 2 years and at the end of this period final results and conclusions will be available.

Table 3.2 General schedule for STGZ initiative: zero and low emission vehicles

INITIATIVE	ACTION	ACTIVITIES	COST (USD)	2012 1	2012 2	2013 1	2013 2	2014 1	2014 2
ZLEVs	Inclusion of 50 ZLEVs in the STGZ	ZLEVs**	2,250,000		■				
		Chargers**	240,000		■				
		Technology Transfer/ Maintenance	500,000		■	■	■	■	■
		MRV process	200,000			■	■	■	■
		Training and communicational campaign *	500,000		■		■		
TOTAL			3,690,000						

**Public sector would finance or partially finance*
***Private sector would finance or partially finance*

3.1.1 Proposed metrics for evaluating success

Most of the commercial fleets use GPS systems to track their vehicles and every vehicle must undergo a yearly inspection where main parameters are registered such kilometres travelled over the year. Both systems can be used for the MRV (measurement, report and verification).

The MRV for this initiative will consider quantitative and qualitative parameters as follow:

Quantitative:

- Funds granted to the initiative
- Funds granted by local government and private sector
- Kilometres travelled by vehicle
- Electricity consumption per vehicle
- Maintenance cost per vehicle

Qualitative:

- Capacities related to operation/maintenance of these technologies
- Improvement on the citizens acknowledgement of the positive health benefits with the incorporation of ZLEV vehicles from the economical and environmentally point of view

3.1.2 Other benefits expected

ZLEV promotion will bring many co-benefits such as:

- Local emission reduction
- Reduction from the vehicle system users exposure to local pollutants
- Reduction to exposure to noise pollution
- Reduction in fuel/energy consumption

Social, economical and sustainability benefits are:

- Creation of an infrastructure for the development of technical capabilities
- Reduction of fleet operational cost
- Improvement of sustainability fleets using electric power as the main energy source

3.2 Transantiago general plan

General activity schedule for implementing the initiative “Low Carbon Buses for Public Transports” in the STGZ is shown in Table 3.3.

The two first activities will be the hybrid and electric bus purchase and the implementation of chargers during the first 6 month of the schedule.

Following this activity, technology transfer activities related to maintenance and training activities for bus operators should commence 6 months before the pilot. In parallel, developing communicational activities focused on citizens to inform of the benefits of this new technology.

Finally, the MRV process is considered for a period of 2 years and at the end of this period final results and conclusions will be available.

Table 3.3 General schedule for STGZ initiative: low carbon emission for public transport buses

INITIATIVE	ACTION	ACTIVITIES	COST (USD)	2012 1	2012 2	2013 1	2013 2	2014 1	2014 2
Low Carbon Buses	Inclusion of 10 Low Carbon Buses in a Service going through the STGZ	Buses (5 Hybrid and 5 Electric)**	3,860,000						
		Chargers**	200,000						
		Technology Transfer/ Maintenance	900,000						
		MRV process	500,000						
		Training and communicational campaign *	1,000,000						
TOTAL			6,460,000						

**Public sector would finance or partially finance*
***Private sector would finance or partially finance*

3.2.1 Proposed metrics for evaluating success

Transantiago has a central control system connected to each bus through its cellular network. The system uses electronic information from the buses to determine kilometres travel, fuel consumption, etc.

MRV (measurement, report and verification) for this initiative will consider quantitative and qualitative parameters as follow:

Quantitative:

- Funds granted to the initiative
- Funds granted by local government and private sector
- Kilometres travelled by bus
- Fuel/electricity consumption per bus
- Maintenance cost per bus

Qualitative:

- Capacities related to operation/maintenance of these technologies
- Greater appreciation of the positive health, economic and environmental benefits due to the incorporation of ZLEV vehicles

3.2.2 Other benefits expected

Low Carbon bus promotion will bring many co-benefits such as:

- Local emission reduction
- Reduction of exposure to local pollutants by transport users
- Reduction of exposure to noise pollution by transport users
- Reduction of fuel/energy consumption

Social, economical and sustainability benefits are:

- Creation of an infrastructure for the development of technical capabilities
- Reduction of operational cost of fleets
- Improvement of sustainability of the fleet using electric power as the main energy source

Local pollutant reductions would be 7.7 (tNOx) and 0.62 (tPM2.5) over a 10 year period.

3.3 Bicycle promotion general plan

General activity schedule for implementing the initiative "Promotion of Bicycle Use" in the STGZ is shown in Table 3.4.

The two first actions will require a final design with Municipality of Santiago support and requirements. The third action will need to select a group of commercial shops that are willing to participate in this pilot. All activities should be done in 6 months.

After this, there is a 6 month period for construction and implementation. In parallel, training and communicational activities will be carried out to be sure that all the MRV data is collected properly in the pilot plans. Also, communicational activities focused on citizens are important for success and should be implemented before or close to start the pilots.

Finally, the MRV process is considered over a 1.5 year period to adapt or improve pilots in the running stage. At the end of this period final results and conclusions will be available.

The following sub-sections include information about parameters used in the MRV process, co-benefits and cost related to this initiative.

Table 3.4 General schedule for STGZ initiative: promotion of bicycle use

INITIATIVE	ACTION	ACTIVITIES	COST (USD)	2012 1	2012 2	2013 1	2013 2	2014 1	2014 2
Promotion of bicycle use	Bicycle ways and signs	Final design*	60,000						
		Construction and implementation	388,000						
		Maintenance*	23,000						
		MRV process	86,400						
		Citizen training* and communica-tional campaign	10,000						
	Bicycle sharing program	Final design*	80,000						
		Construction and implementation	14,000						
		Operational cost**	210,000						
		Training and communicational campaign*	10,000						
		MRV process	24,000						
	Commercial activities with non motorized vehicles	Shops implemen-tation**	400,000						
		User training and communicational campaign*	10,000						
		MRV process	56,000						
TOTAL			1,371,400						

**Public sector would finance or partially finance*
***Private sector would finance or partially finance*

3.3.1 Proposed metrics for evaluating success

The MRV (measurement, report and verification) for this initiative will consider quantitative and qualitative parameters as follow:

Quantitative:

- Funds granted to the initiative
- Funds granted by local government and private sector
- Kilometres travelled by bicycle replacing motorbikes
- Number of bicycles replacing motorbikes
- Number of bicycle trips
- Modal shift to bicycle mode
- Average trip distance by bicycle
- Accident rate
- Bicycle flow measurement

Qualitative:

- Capacities related to bicycle use among citizen
- More bicycle infrastructure in the STGZ limits (inflation points, workshops, parking in shops/ services, etc)
- Improvement on the citizens acknowledgement about the positive effects of the bicycle mode integration as a sustainable transport mode
- Potential to achieve private investment to replicate this initiative in other cities

The first stage of the implementation of this initiative considers the selection of shops for the motorbike replacement program and training sessions for the pilot bicycle sharing scheme. Also, a communicational campaign should be carried out to inform people of the implementation of this initiative.

In parallel, baseline data collection should be designed to measure bicycle flow taking in representative city points and surveys should be carried out. The bicycle sharing program will provide all data from operational use. Regarding commercial activities, bicycles that replace motorbikes should be equipped with an odometer to count the kilometres travelled.

The second stage considers measurement activities. They should be carried out, at least, every two weeks the first year after implementing the initiative using type of day (Monday to Thursday, Friday and weekends) and by hour.

Evaluation should be carried out monthly in order to detect any problems in the implementation process and evaluate any improvement that could be incorporated.

3.3.2 Other benefits expected

Bicycle promotion will bring many co-benefits such as:

- Local emission reduction like PM
- Less noise pollution as bicycle is a non motorized vehicle
- Less congestion, especially in the STGZ which is a busy area in the Santiago Capital
- Greater appreciation of public spaces and particularly for the STGZ that has many historic spots
- Better accessibility and greater equity
- Greater demand for shops that participate in the STGZ

3.4 Traffic re-design and traffic management general plan

General activity schedule for implementing the initiative “Traffic Re-Design and Traffic Management” in the STGZ is shown in Table 3.5.

The first action will need to select a group of underground parking service companies that are willing to participate in this pilot. The second action will require a final design with the support of the Municipality of Santiago for establishing requirements. All activities should be carried out within 6 months.

After this period, 6 months will be necessary for construction and implementation for a bicycle parking pilot and 1 year for construction in Moneda St. In parallel, training and communicational activities will be carried out in order to be sure that all the MRV data would be collected properly in the pilot plans. Also, communicational activities focused on citizens are important for success and should be done before or close to start of the pilots.

Finally, the MRV process is considered over a 1.5 year period where pilots can be adapted or improved in the running stage. At the end of this period final results and conclusions will be available.

The following sub-sections include information about parameters used in the MRV process, co-benefits and cost related to this initiative.

Table 3.5 General schedule for STGZ initiative: traffic re-design and traffic management

INITIATIVE	ACTION	ACTIVITIES	COST (USD)	2012 1	2012 2	2013 1	2013 2	2014 1	2014 2
Traffic re-design and traffic management	Integrated bicycle parking infrastructure	Final design*	20,000						
		Construction and implementation	224,000						
		Operational**	320,000						
		Citizen training and communica-tional activities*	10,000						
		MRV process	50,000						
	Better sidewalks and public spaces for pedestrians	Final design*	80,000						
		Construction* and implementation	5,500,000						
		Communication campaign*	10,000						
		MRV process	30,000						
TOTAL			6,244,000						

**Public sector would finance or partially finance*
***Private sector would finance or partially finance*

3.4.1 Proposed metrics for evaluating success

The MRV (measurement, report and verification) process will work at least with the following indicators:

Quantitative:

- Funds granted to the initiative
- Funds granted by local government and private sector
- Bicycle lots occupation increment
- Modal shift from motorized vehicle to bicycle
- Bicycle lots occupancy rotation
- Average bicycle trip length
- Accident rate

Qualitative:

- Annual surveys on the perception of the quality of service after the application of the pedestrian initiative
- Greater appreciation of the positive effects of the bicycle and pedestrian mode integration as a sustainable transport mode
- Potential to achieve private investment to replicate this initiative in other areas

3.4.2 Other benefits expected

This initiative will bring co-benefits such as:

- Local emission reduction like PM
- Greater appreciation of new public spaces for pedestrians
- More pleasant, sustainable and safe environment to the thousands of pedestrians that use every day the STGZ
- Incentive for the implementation of other sustainable projects in the STGZ

4. Conclusions and Recommendations

4.1 General conclusions

Four Initiatives for promoting low carbon emission transport modes are proposed for implementation in the Santiago's Transport Green Zone (STGZ), which is located in the centre of Santiago City in the Municipality of Santiago territory.

The STGZ covers around two square kilometres and will integrate:

1. **Low carbon buses for public transportation**
2. **Promotion of Zero and Low Emission Vehicles**
3. **Promotion of Bicycle Use**
4. **Traffic Redesign and Traffic Management**

All four initiatives have a great potential of GHG reductions and are technically and legally feasible as proposed in this report.

STGZ will reduce 13,800 tCO_2 in 10 years. Economic evaluation of the STGZ indicates that total NAMA cost will be 17.7 MM USD where 70 % should apply for international funds (NAMA funds) and the other 30 % will come from local stakeholders like Municipality of Santiago, Chilean Government and private sector.

The General Implementation Plan will be completed over a period of 2,5 years, starting from the final design of the project and including implementation, the MRV process, training and promotion of the initiative in the community.

In addition, four Concept Notes were defined for each initiative, in order to summarize all relevant technical and economic information and the main tasks to be performed to achieve each initiative. These Concept Notes will be used for applying for international funds.

The STGZ has strong support from local stakeholders and especially from the Municipality of Santiago, which is the local government of STGZ territory. Other sectors such as the academic sector, the private and NGOs are willing to support and implement the different pilots proposed in this project as it will be a great opportunity to participate in the implementation of many sustainable transport initiatives in parallel.

The Santiago Transport Green Zone is intended to change citizen's behaviour in terms of mobility inside the city, which is one of the main goals of this NAMA.

One of the main conclusions of the STGZ is that it must be consider as a Pilot Project with an enormous potential of being replicate in others cities or expanded trough the city. A very concrete project located not only on the main City of Chile but also on the main area of this City: Santiago.

4.2 Specific conclusions

The main conclusions related to the specifics objectives are listed below:

- International research was developed in London- United Kingdom, Barcelona-Spain, Paris-France and Munich and Frankfurt-Germany. This activity included on field research and interviews to local citizens about different sustainable transport initiatives. Bicycle sharing systems, hybrid and electric vehicles for different categories (taxi, motorbikes, buses) and low emission zones where the most consolidate international successful experiences in low carbon emission initiatives.

- Chilean stakeholders were identified and interviewed in order to present this project and obtain preliminary comments about how should be and what should be included into the Transport Green Zone.

- Geographical area of the Santiago Transport Green Zone (STGZ) was delimited in conjunction with the Municipality of Santiago. The selected area is limited by Manuel Rodríguez St (west), Pío Nono St (east), Santa María St (north) and Av. Libertador Bernardo O'Higgins (south), covering about 2 km^2.

- Four initiatives were defined in the STGZ and feasibility study, economic evaluation and legal analysis were performed.

- The first initiative is Promotion of Zero and Low Emission Vehicles (ZLEV) and includes three actions:

    - Free parking for ZLEV vehicles
    - Promotion of ZLEV Taxis inside the STGZ
    - Promotion of ZLEV for the Municipality fleet

  The cost of this initiative is estimated in 3,690,000 USD, where 1,190,000 USD will come from local stakeholders and 2,500,000 USD should come from NAMA international funds. Emission reduction estimated for this initiative is 3,472 (tCO2) in 10 years.

- The second initiative is Low Carbon Emission for Public Transport Buses includes a Pilot Program with 5 Full Electric buses and 5 Hybrid buses. The cost of this initiative is estimated in 6,460,000 USD, where 2,700,000 USD will come from local stakeholders and 3,760,000 USD should come from NAMA international funds. Emission reduction estimated for this initiative is 5,079 (tCO2) in 10 years.

- The third initiative is Promotion of Bicycle Use and includes three actions:

    - Design of bicycle ways
    - Bicycle sharing program
    - Commercial activities using non motorized vehicles

  The cost of this initiative is estimated in 1,371,400 USD, where 416,000 USD will come from local stakeholders and 5,454,000 USD should come from NAMA international funds. Emission reduction estimated for this initiative is 5,200 (tCO2) in 10 years.

- The forth initiative is Traffic Re-design and Traffic Management. The cost of this initiative is estimated in 6,244,000 USD, where 790,000 USD will come from local stakeholders and 5,454,000 USD should come from NAMA international funds. Emission reduction estimated for this initiative is 86 (tCO2) in 10 years,

which only represent emission reduction from the first action "Integrated bicycle parking infrastructure". This initiative includes three actions:

- Integrated bicycle parking infrastructure
- Exclusive ways for Low Emission Public Transport Buses
- Better sidewalks and public spaces for pedestrian

- These four initiatives were presented, analysed and validated in a Workshop the past 16th of December 2011. People who attended came from Municipality of Santiago, Ministry of Environment, Ministry of Transport, Academia, Private sector and NGO's.

- 4 Concept Notes were developed in order to help this STGZ apply to international funds in a future implementation process.

4.3 Recommendations

In order to complement the third stage of implementation, some recommendations should be considered for supporting the STGZ and the success of their pilot plans.

- As is mentioned in Chapter 2, STGZ should include a Corporate Image development in order to promote and communicate to citizen all the initiatives that will be involved in the area. In this context, there are some projects from Municipality of Santiago that can complement the proposal showed in section 3.6. One master project that could be include in the STGZ implementation plan is to become one of the main Municipal building as a green wall building, as Figure 4.1 shows below. This project was evaluated and the Municipality wants to reactivate it.

Figure 4.1 Green wall proposal for the STGZ corporate image, Municipality of Santiago building

Source: Municipality of Santiago

- As many stakeholders would participate in the STGZ implementation process, a legal tool called "Convenio Marco" (Framework Agreement) should be considered in order to establish responsibilities, funds granted and time schedule for each donor, institution or private that actually participate, in order to assure the success of implementing the STGZ.

- If the STGZ is implemented in the future, the Corporative Image should be complemented with a communicational campaign to inform citizens of the activities and pilot plans that have been implemented and to promote the sustainable transport ways of the STGZ.

- Citizen participation activities should be realized in the Municipality of Santiago, as many initiatives will consider territory modifications.

- Municipality of Santiago Ordinance has the decree Nº299 from year 1994, where taxis are restricted to get into the city centre without passengers. This decree was very successful at the beginning but now it is not respected because there is no legal control. As STGZ is inside this restricted area, it is recommended to reactivate the decree Nº299 and give extra benefits to zero and low emission taxis.

- The Municipality Legal department should be involved in the next stages of the STGZ (Financing and Implementation stages) for making viable the project and review future agreements, contract modification, ordinance law modification, and others that might help the STGZ success and make it sustainable by the time.

- The pilot proposal for 202 bus service is legally possible as Transantiago mentioned. However, Municipality of Santiago has made one suggestion about the others bus lines that run in the first 3 blocks from the northern limit of Teatinos street. They suggest that this street should be only for the 202 pilot and the other services should run only for San Martín street (2 blocks on west direction from Teatinos), instead of actual situation where several services run 3 blocks in Teatinos St, making a lot of congestion when buses turn right for changing from there to San Martín St.

- Future process for underground parking biding should incorporate into their terms of reference the inclusion of bicycle parking place. This kind of contract has been established already in other communes like Providencia and Ñuñoa.

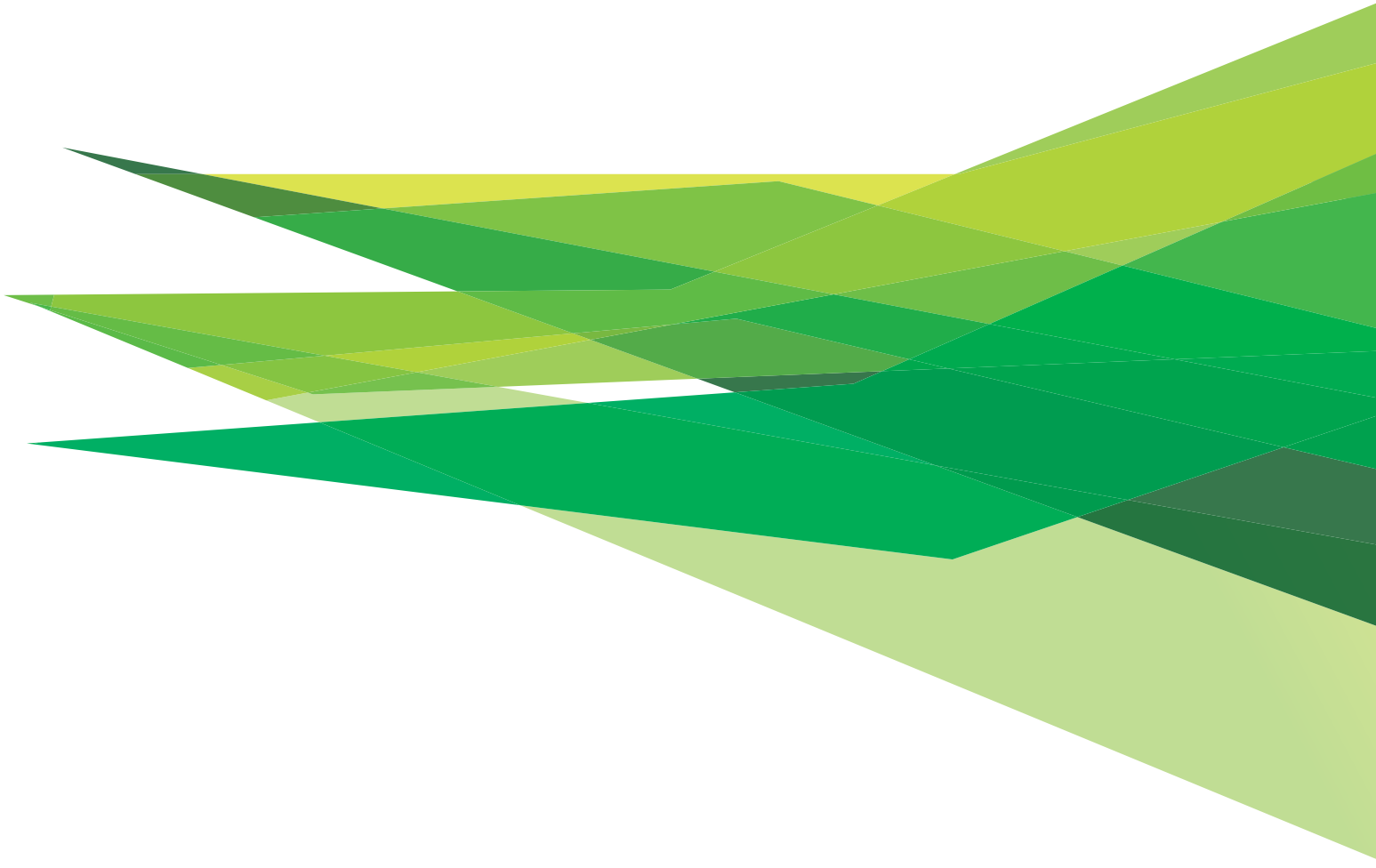
- One private company that manages underground parking commented some recommendations that should be taken into account at this possible stage like:

    - If a pilot plan is implemented, it is required to review every contract previously (for each underground parking) in order to identify any change that could be necessary. The person from Municipality that is in charge of this kind of contract is the Construction Director
    - It should be required to develop an specific legal framework for giving a safe and secure service to bicycle users
    - It is important to review access points for bikers

- There is one successful experience that is actually operating inside the STGZ (Huérfanos St 869, Galería España). This place has an underground parking for its residents and there are 30 bicycle parking spots available only for them. It is actually full and the monthly cost is around 10 USD. The system works with the same building's guards. This experience should be considered in a future implementation process in the STGZ.

Bicycle promotion requires improvements in the Chilean Transit Law. If this initiative brings more bikers then more specific rules, rights and duties should be defined for Bicycle Mode.

- The two bicycle ways proposals were reviewed with the Municipality of Santiago-SECPLAN and they were approved. However, this two bicycle ways should consider connection design in their four end-points in order to actually expand and connect with the actual and future Santiago's Bicycle Ways Network. In the northern point there is a bicycle way in "Los Reyes" Park, in the southern point there are two bicycle ways: Alameda Av and Bulnes St, in the eastern point there is a bicycle way in "Forestal" Park and finally, in the western point there is a bicycle way in Huerfanos St. These existing infrastructures should be taken into account for a detailed design of the bicycle ways proposal in order to connect them properly.



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