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ACRONYMS:

ADO	Automotive Diesel Oil
ALS	Area Licensing Scheme
CBD	Central Business District
CCTV	Closed Circuit Television
COE	Certificate of Entitlement
ERP	Electronic Road Pricing
FK	Faaiuga a le Kapeneta (Cabinet Directive)
LRT	Light Rail Transit
LTA	Land Transport Authority
MOF	Ministry of Finance
MRT	Mass Rapid Transit
PUMA	Planning and Urban Management Authority
SDS	Strategy for the Development of Samoa
ULP	Unleaded Petrol
WTO	World Trade Organization

ABSTRACT

The pressure on our road/transport system will not hold in the coming decades, unless we develop an environmentally friendly, innovative and efficient transportation plan. This research paper is an initiative by the Ministry of the Prime Minister and Cabinet as a perceptive countermeasure into the challenges currently encountered by Samoa's road systems, taking into account potential challenges in the future. This paper therefore focuses on the current challenges faced by our road systems, as we continue to import more vehicles into the country. The paper also discusses how the Government through the Land Transport Authority may examine alternative platforms for our road infrastructures, in light of best practices found in other jurisdictions around the Pacific region. Overall, the Research Paper hopes to provide measures that will alleviate and minimize challenges to our infrastructure and provide possible solutions that our Government may explore and invest to in the future.

At the global level, this Research is in line with the United Nations Sustainable Development Goals 2030 (Goal 9 responding to Goal 11 and 13 and eventually achieving Goal 8), and the S.A.M.O.A Pathway (Sustainable Transportation Statement 66 and 67). Nationally, the Paper links to the Government's long term sectoral development priorities as identified in the Strategy for the Development of Samoa (SDS) 2016/17-2019/20 and in support of Government's long-term policy document, the Samoa 2040. Instantaneously, transport links all forms of development: economically, time is money. Better access and movement in a timely and efficient manner reduces economic costs; socially poor and improper road infrastructure increases the risk on our people during natural disasters, in distributing relief supplies and conducting rescue operations. Evidence based findings show that it is cost effective if future transport infrastructure planning considers climate change, limited parking spaces and ongoing traffic congestion. In the interest of national security, proper road systems save life. Therefore, Samoa's road system is a cross cutting matter that affects all sectors of its economy, and requires a holistic whole of Government approach.

Based on the experiences of New Zealand, Australia and Singapore, this Paper recommends:

- Constructing inland highways/freeways that runs from the Aleipata to Falelatai;
- Introducing railways, electric busses, tunnels to address the need for additional modes of travelling and commuting;

- Strengthening the enforcement and monitoring of parking meters in the town area;
- Installing of CCTV cameras to assist with enforcement of not only traffic offences (including parking meters), but providing ongoing 24/7 security in the urban area;
- Construction of eco-friendly bridges that can connect islands of Samoa;
- Developing of a waste management service/system that serves to address the vehicle waste problems; and
- Developing of a transportation system that will encourage the use of public transport and controls the time and travels into the town area as in Singapore.

From a whole of government perspective, the Paper concludes that unless constructive and proper planning are in place, the effects and pressure on our transport system will be too costly for Government to bear. However, we can and should, if we continue as a single unit

BACKGROUND:

Roads are an integral part of every transport systems globally. They play a significant role in achieving national developments and contribute to the overall progress and sustainability of every country's economic, social and environmental developments. It is therefore fundamental for every transport networks/system to be efficient and effective in order to maximize economic and social benefits.

Samoa's transport system (roads, bridges etc.) as stipulated in the National Strategy for the Development of Samoa, (SDS) 2016/17 – 2019/2020, contributes to boosting productivity for sustainable development. The transport system as in Key Outcome 10 of the SDS 2016/17 – 2019/2020 provides the sustainable platform that enabled other sectors including economic, social and environmental development.

Since the launch of the SDS 2016/17 – 2019/20, Samoa has progressed rapidly in improving its transport infrastructure when compared to the last ten years. The development of new access roads in the rural areas, the reconstruction of old bridges (Maliolio & Vaisigano), enhancing climate resilience on access roads along the coastline (West Coast Road) and ongoing road maintenance are major developments that are currently being implemented by Government, with the assistance of its donor partners. However there are associated challenges, which will result in major threats to the future of Samoa's road infrastructure in the next 20 to 30 years. These challenges are also deliberated and discussed in this research.

The Samoa Land and Transport Authority (LTA) is mandated under the Land and Transport Authority Act 2007 to carry out construction and maintenance of national/public roads, improve the standards of public transportation, and upkeep the maintenance of public road standards. The Authority was set up by Government and became effective in 2009. Since its inauguration, the Authority has developed a number of major road developments over the years which has resulted in the existing sustainable road infrastructure development platform.

AIM:

This research paper aims to identify critical areas that Samoa through the LTA, can better implement a more transformative transport system. This system will ultimately address all the challenges faced today taking into account best practices facilitated by other countries/jurisdictions within the Pacific region as well as New Zealand and Australia.

This research paper will also build on the existing feasibility studies and plans that the LTA currently has in relation to road and transportation development, as well

as supporting data provided by other relevant government agencies. These information will inform provide an evidence based, practical and informative advice to Government, on the future plan for Apia transport network. This work will add tremendous value to achieving Government's long term development priorities as identified in the Strategy for the Development of Samoa (SDS) 2016-2020, as well as the Samoa 2040 document, as transport development platform crosses and cuts across all sectors of the Samoa's development.

OBJECTIVES:

The objectives of this research paper entail the following:

1. To identify challenges and pressing issues currently faced by Samoa's Transport Network, specifically on road infrastructure;
2. To discover how Land Transport Authority in other jurisdiction are dealing with these challenges and find out their approaches in alleviating these challenges; and
3. To identify future priorities for a plan to improve Samoa's transport system in the next 20 years.

OVERVIEW OF SAMOA'S ROAD INFRASTRUCTURE

Samoa is a small Pacific Island State with a population of approximately 197,000 people¹. It consists of two (2) main islands of Upolu and Savaii and eight (8) small islands and has a total land area of approximately 2,935 km. On the two (2) main islands, there are about 1,150km of classified roads (747 km on Upolu & 403 km on Savaii) and 52 bridges (44 bridges on Upolu & 8 bridges on Savaii). Roads are critical in Samoa, as approximately 70 percent of Samoa's population lives within one kilometer of the coast. In addition, critical infrastructure such as hospitals, schools, places of employment, tourist infrastructure, port facilities, power plants, airports and main roads are located primarily in the coastal zone².

Road developments in Samoa in the early days include the Apia to Faleolo road which was first recognized in 1969 as an arterial road connecting the capital Apia with Faleolo International Airport and Mulifanua Wharf.³ The Faleolo Road Act 1969 was then passed by Parliament for the purchase of land to create a 30m road reserve for the upgrade and realignment of the existing narrow and winding road which is currently appealed by the Ministry of Works Act 2002.⁴ The Apia road network and the surrounding district were later developed in the 1970s to meet the transportation and traffic needs until the twentieth century,

¹ Samoa Bureau of Statistics, 2017

² Land & Transport Authority, Environmental and Social Management Framework, March 2018

³ Vaitele Street Upgrade – Abbreviated Land Acquisition and Resettlement Plan, LTA 2014

⁴ ibid

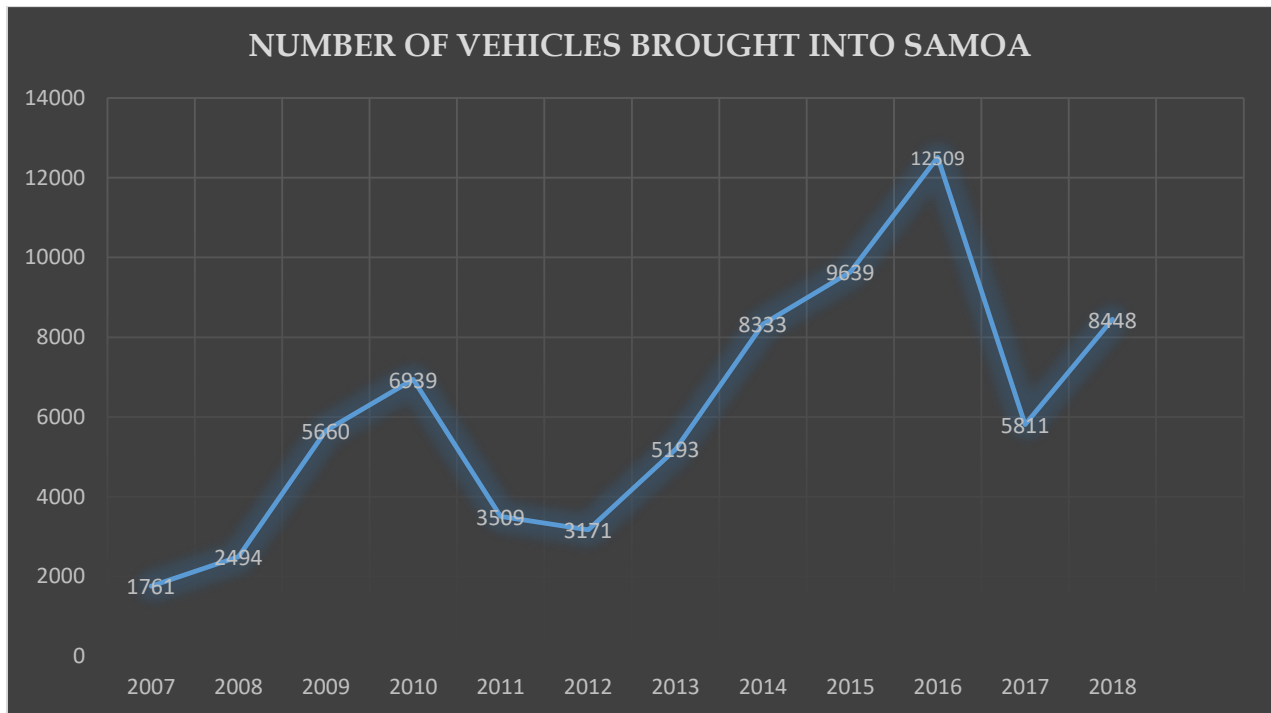
Samoa's economic growth had brought with it a huge increase in traffic due to the road switch in 2009 where most Samoans living in Australia and New Zealand have shipped home affordable vehicles for their families. Today, there has been a number of issues generally observed facing Samoa's road transport system and it brings into much attention what the future of road transport in Samoa will look like in the next 50 years.

PART 1: ISSUES ON SAMOAS CURRENT ROADING SYSTEM:

Trend of Cars brought into Samoa:

Thousands of vehicles are imported into Samoa every year. As shown in figure 1 below, the total amount of vehicles (private use and commercial) imported into Samoa from 2007 to 2018 amounts to a massive 78,545 which is about 1 car per 3 people. As a small island state facing numerous challenges to its transport infrastructure, this amount is quite high and alarming as the trend of imported vehicles continues to rise.

FIGURE 1:



Source: Ministry for Customs & Revenue 2019

The slight increase of imported vehicles from 2007 to 2008 was a result of Samoa's initiative in banning the importation of vehicles older than 12 years, as well as the ban on importing left hand drive vehicles as per Order 2(i) and Order 2(ii) of the Order of Prohibited Imports⁵. During and after the road switch in 2009 to 2010, the number of vehicles brought into Samoa increased significantly from over 5000 in 2009 to nearly over 8000 in 2018.

When Samoa became a member of the World Trade Organization (WTO) in 2012, reviews were made for some trade policies during Samoa's accession as some mentioned bans were identified by the WTO as inconsistent, discriminatory and unnecessary⁶. From 2012 to 2016, many exceptions were made to address WTO requirements and expected commitments from Samoa. Consequently, the number of imported vehicles had continued to increase. However, crucial amendments made by Cabinet in 2017 led to a huge reduction in number of imported vehicles. These amendments were enunciated in FK (17)05 and FK (17)06:

- A quantitative import restriction of 100 left-hand drive 4WD pickups per month;
- Imported left-hand drive 4WD pickups not to be used for public transport;
- Restricting importation of left-hand drive 4WD pickups for personal use only, not for commercial use/car dealers;

Samoa has agreed to take certain measures for its commitments of being a member of the World Trade Organization. These has included repealing the current import ban on vehicles older than 12 years and replace it with a non-automatic import license that enforced inspection of imported vehicles older than 12 years to the same standards. Importation would be denied only to those vehicles that could not meet the mandated safety and environment requirements⁷.

Given that Samoa has removed its ban on 12 years vehicles as part of its commitments, the number of vehicles being imported into Samoa will continue to increase every year, having thus putting pressure on Samoa's infrastructure, such as the public roads, car parks, petroleum products and ongoing threats and impacts on the environment.

⁵ Ministry for Customs and Revenue, 2nd May 2008,

⁶ Ministry of Foreign Affairs and Trade, 2018

⁷ Ministry of Foreign Affairs and Trade, 2018

Pressure on other Public Utilities:

Public Car Parks

Parking facilities along the center of Apia are typically inadequate as new developments are on the rise. Samoa is already facing traffic problems due to the rapid increase in the number of vehicles on the road. This increase is expected, especially of private vehicles as more households can now afford purchasing more than one vehicle (most families have on average two vehicles, max three) as a result of Samoa's road switch in 2009.

A research conducted by PUMA in 2004 revealed the difficulties in finding car parking spaces in the Apia urban area. The research pointed out that parking is a major traffic management issue confined not only in urban areas but all of Samoa. Consequently, PUMA has developed the **Parking Policy and Standards** in 2006. This Policy seeks to ensure that all proposals for new developments will be considered against car parking development standards⁸. The introduction of car parking standards to new development is a development control and a key planning tool, which is intended to reduce the level of traffic congestion and ensure accessibility.



Limited parking spaces in-front of NZ Immigration Headquarter at Tamaligi

Alternatively, the Land Transport Authority has introduced parking meters. This control measure aims to ensure car parks are available for the public and to cater for the increase of vehicles in town during working hours. (8am-5pm) Eight (8) parking meters have been placed around assigned areas along Beach Road, Apia

Given that the number of vehicles is still on the rise, it is anticipated that parking lots will be a major challenge in the future of Apia. It is expected that the current control measures will not be capable to cope unless more parking spaces are constructed.

⁸ Ministry of Natural Resources and Environment, *Parking Policy and Standards 2006*,

Roads

Traffic congestion is mostly common in big cities around the world. Even for a small nation with only a developing town, Samoa is already experiencing the full plunge and impacts of having too many cars. The significant increase in vehicle ownership, (for both private and commercial use) has contributed enormously to traffic congestion.



Traffic jam experiencing along the Main Beach Road during working hours

in Apia. The main bus terminals (public transportation services) are concentrated behind the main flea market in Apia.

These factors all contribute to the traffic congestion within the Apia CBD area. These are also highly visible and experienced during peak times, from 8am to 9am when students and workers, farmers and fishermen used private and public transport services. Traffic congestion is also worst from 2pm to 4pm when students finished schools. From 5pm, when workers returned home, the speed of traffic away from Apia is usually at a turtle's pace.

Impacts on Health & Safety, Climate Change

Most people do not realize the extent of the effects heavy traffic can have. Congestion can have a tremendous impact on one's personal life, career and even safety⁹. The delays that are caused by the congested roads during peak hours may be seen lightly by others but it is definitely costly to others¹⁰. Samoans are not prone to experiencing the effects of additional stress because of delays caused by traffic. The impact on the environment is of major concern. When vehicles are idled, notable increase in fuel consumptions usually lead to the emission of carbon monoxide, nitrogen oxides, volatile organic compounds,

⁹ <https://traveltips.usatoday.com/effects-traffic-congestion-61043.html>

¹⁰ *ibid*

particulate matter and carbon dioxide into the atmosphere¹¹. Hence, traffic congestion also adds to environmental pollution¹², thus fueling the effects of climate change on our vulnerable ecosystem. The risk of these gases on our people is significantly high when vehicles are idling during traffic congestion. Any threat on Samoa's environment and its people exposes and intimidates our national security.

Imported Petroleum Products:

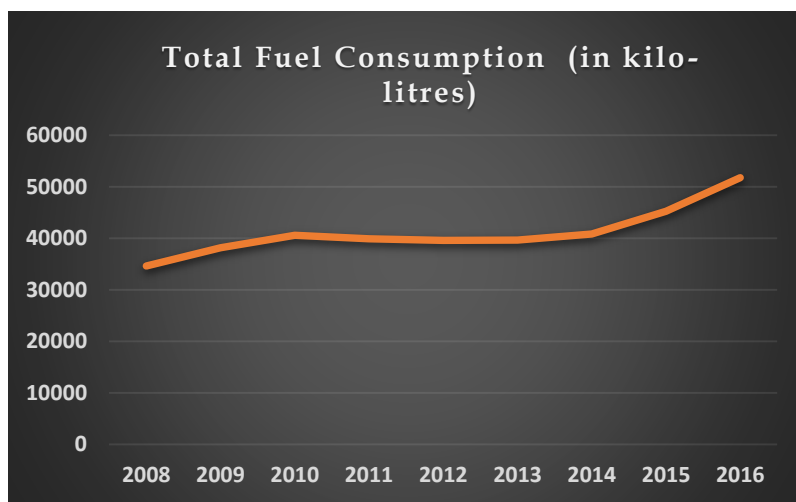
Fossil fuels are an extremely important source of energy in Samoa as it is in most other countries in the world. Petroleum dependence in Samoa is more troublesome because of the crucial role it plays in the development of the country¹³. The high dependence of Samoa on imported petroleum will only increase given the continuing increase in the number of overseas vehicles being imported every year for private and commercial purposes.

Statistics show a strong correlation between the growing number of vehicles coming into Samoa and the increase in fuel consumption every year. This is further corroborated in the data provided in Figure 2 below. All vehicles in Samoa run on either the Unleaded Petrol (ULP) or Automotive Diesel oil (ADO). Furthermore, the road transport subsector, as highlighted in the MOF Energy Sector Plan 2017 – 2022, is by far the greatest source of demand for petroleum consumption, accounting for **68% of the total** as of 2015¹⁴.

FIGURE 2:

Year	Total Fuel (in kilolitres)
2008	34620.18
2009	38147.43
2010	40601.45
2011	39888.72
2012	39551.16
2013	39672.52
2014	40825.91
2015	45240.64
2016	51778.36

Source: Energy Division, MOF



¹¹ Rahman et al., 2013 in Energy Conversion and Management 74: 171 – 182, <http://www.sciencedirect.com/science/journal/01968904>

¹² <https://traveltips.usatoday.com/effects-traffic-congestion-61043.html>, 2019

¹³ Janis McDaid Ikeda, *The impact of rising oil prices and Imports on a pacific island economy*,

¹⁴ MOF, Samoa Energy Sector Plan 2017-2022, 22

Apparently, the more vehicles on Samoa's roads the higher the petroleum consumption needed. Eventually these resulted in the increasing amount of harmful gases emitted into our atmosphere, polluting our environment. Ultimately, our national security is compromised and threatened.

Absence of a Waste Management Policy/Strategy Framework for Samoa:

Waste management is mandated under **Waste Management Act 2010** whereby Ministry of Natural Resources & Environment has been tasked to formulate and implement strategies to manage all wastes accordingly. A **National Waste Management Policy** was developed/formulated/implemented in 2001 and given Samoa's current environment commitments and changes over the last 20 years, it is subject to a review. **A National Waste Management Strategy** is currently under drafting processes by the Ministry of Natural Resources and Environment. However, enforcement on discharging old vehicles around family backyards is not being prioritized and proactively monitored by Government authorities.

Managing car waste in Samoa is a huge undertaking. Without an updated strategy and policy on managing the disposal and dumping of old vehicles, the environment continues to bear the consequences. Car wastes have become eye soring, piling up or crumpling near family homes. These wastes constantly contribute to the demise of the environment and sadly impacts on our people's health. The growing number of second hand vehicles imported might turn Samoa into a scrap yard in the future, if proper regulations and policies are not reviewed and used to monitor car waste.

Trade in waste exists in Samoa, however **dismantling facilities are limited** to only two companies. These companies are currently exporting recyclable wastes, particularly scrap metal and plastics and they export on average four containers of scrap metal each quarter of the year¹⁵. Only one Company (Pacific Recycle) has a facility specified for dismantling of old vehicles. This simply means, Samoa do not have enough facilities to cater for the number of vehicle disposals. Government should invest in providing more appropriate recycling facilities in the future, to allow the Ministry of Natural Resources and Environment to enforce proper discharging of old vehicles across the whole country.

¹⁵ MNRE, State of the Environment Report 2006, 141

Impact of Climate Change to Samoa's Road Infrastructure:

Infrastructure vulnerability to climate change is increasing around the world and Samoa is particularly vulnerable. The whole island population is highly vulnerable to different hazards, and people facing the highest risks are those living in the coastal areas. The changes in climate and climate variability predicted in the previous State of the Environment Report 2006 are now a reality. These included the increase in maximum air temperatures, increase frequency in extreme daily rainfall events and sea level rise of between 2.7 – 8.3 mm a year¹⁶.



Biggest Landslide occurred in Tuialamu, Lalomanu

Samoa's transport network is highly vulnerable to various factors including sea level-rise, storm surges, flooding and landslides, largely due to its proximity to the coastline. There were a number of incidents resulted from these natural phenomenon. One of the biggest landslide tragedy recorded took place at Lalomanu village where the hills rolled onto the road and several meters out to the sea. Coastal roads on the East side of Upolu are also vulnerable to landslides during cyclones, heavy rainfall and extreme rising sea levels. Shortly after Cyclone Gita hit Samoa in 2018, other hazard catastrophes occurred on the east side of Upolu. Landslides occurred at Luatuanuu and Solosolo villages of the Anoama'a district.



Landslides frequently occurred on the east coast road during heavy rainfalls.

¹⁶ Ibid: 141

Figure 3



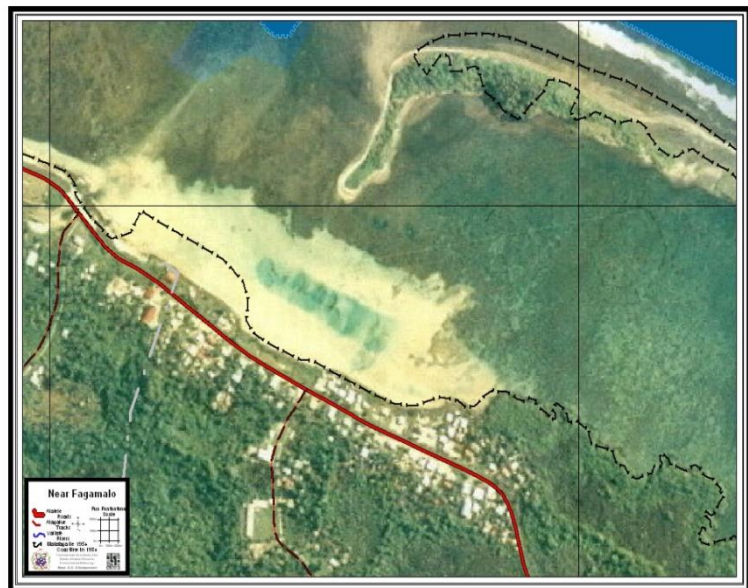
Shifting coastline from 1954 till 1999:
Solosolo Upolu

along the coast¹⁸. Maps provided by the Ministry of Natural Resources and Environment, strongly supported and proved that rising sea-level is not a myth.

It is therefore crucial to consider these predictions in future road developments for Samoa. Alternate routes should be considered and be shifted inland allowing people to relocate and move towards higher grounds.

The Samoa climate Resilient Transport Project, funded by the World Bank and administered by the LTA, provides another pathway in minimizing the effects of climate change on our transport system. The project “involves the study, design and construction of identified priority road assets to improve their resilience to climate-related

Sea level rise on the other hand has continued to threaten Samoa’s coastal roads and settlements. **Sea level rise is expected to continue to rise in Samoa and it is projected to be in the range of 5-15cm by the year 2030¹⁷.** The sea-level rise combined with natural changes from year to year will increase the impact of storm surges and coastal flooding. These will contribute largely to the loss of land. Losing land to sea-level intrusion and coastal erosion has been discovered in some coastal villages in Samoa as portrayed in Figure 3 above. The destructive action of storm surges coupled with sea level rise and sand mining has resulted in a significant loss of land



Shifting coastline from 1954 till 1999: Fagamalo Savaii

¹⁷ Samoa Meteorology Division MNRE, Current and Future Climate of Samoa

¹⁸ MNRE, State of the Environment Report 2, State and Trends of the Environment

hazards and/or events. The integration of climate change considerations into infrastructure activities will help to strengthen the resilience of assets and improve functionality of the transportation network”¹⁹.

Samoa Climate Resilient Transport Project underway:

The Samoa Climate Resilient Transport Project is currently on full swing focusing on building resilience in the infrastructure and institutions through four main components²⁰;

1. Technical assistance to improve the way that climate change is factored into road development, including through better asset management and planning systems.
2. Infrastructure investments to improve the climate resilience of the West Coast Road between Malua and Faleolo, and slope protection and stabilization and drainage on the East Coast Road to reduce landslip and rockfall hazards. Further works will include the replacement of the Afega Bridge and the Lano Ford Crossing, and a study into potential future upgrades of Alafa'alava Road.
3. Institutional and regulatory reforms for road sector asset management and maintenance, including measures to strengthen local capacity and to increase the sustainability of climate resilient road investments.
4. A provision for the Government of Samoa to redirect uncommitted project funds to rapidly fund urgent post-disaster rehabilitation or reconstruction needs in the event of a major natural disaster.

The Government of Samoa has been working hand in hand with the World Bank on improving Samoa's road network through multiple projects. World Bank's assistance has played a huge role in supporting Samoa's infrastructure development to date. **US\$35.75 million** was granted in September 2018 to improve the climate resilience of Samoa's road network and facilitate a rapid response in the event of natural disasters²¹. This was through the International Development Association, the World Bank's fund for the world's most in-need countries.

¹⁹ Land Transport Authority 2017, 'Enhancing the Climate Resilience of West Coast Road Environmental and Social Management Plan (ESMP)' Apia

²⁰ Ibid

²¹ <https://reliefweb.int/report/samoa/world-bank-enhance-climate-resilience-samoa-s-road-network>

PART 2: ROAD TRANSPORT ISSUES & DEVELOPMENTS IN OTHER JURISDICTIONS:

Australia:

Over 70 per cent of all domestic passenger movements within Australia occur on roads. Driving remains by far, the preferred means of transportation within cities and for trips up to 400 kilometers. This has resulted in suboptimal energy efficiency and a congestion cost to the economy worth AUD\$15 billion per year.

Based on current trends, **congestion** is projected to increase, imposing burdens on those living in Australian cities, those seeking to move goods through Australian cities, and to the national economy. Particular **constraints on freeways and highways** will emerge, constraining productivity within cities and regions.

Significant challenges and forecast demand that the Australian local governments consider the following:

- **Expansion of road assets** to improve levels of service and cater for the growing population;
- **land-side access** to the State's rapidly growing ports and airports;
- **address congestion** on the metropolitan road networks;
- public transport services, by **improving speed, reliability and frequency**;



- **more road infrastructure** for easy housing access;
- **Climate change** impacts on infrastructure maintenance, which are aligned not only to extreme events (i.e. storms, heat waves, floods, and bushfires) but also impact on asset maintenance in relation to ongoing changes in the use of

infrastructure; and

- Between 26,000 and 33,000 **kilometres of road** and 1,200 to 1,500 **kilometres of railway** are **potentially at risk if sea levels rise by 1.1 meters** (estimated to occur by the end of the century) and there is 1 in a 100 year storm surge event or high tide event.

Rail dominates freight movements between Perth and the eastern states. Rail freight, mainly supporting commodity exports, is expected to jump by two-thirds by 2030, increasing pressure on the rail system. Rail traffic on the Brisbane, Sydney and Melbourne route faces **capacity constraints** around Sydney, with a dedicated rail freight line to the north required to deliver a larger modal share to rail.

At present, the only route between Melbourne and Brisbane is through Sydney. An **inland route** has the **potential to provide a rail freight option up to 7 hours faster and 170 kilometers shorter, making rail a more competitive transport option relative to road**. The freight task and volume of container traffic is increasing substantially, proportional to the overall growth rate of the economy. Passenger rail is generally given priority over freight services in cities. Rail makes up a very small portion of passenger kilometers, but it has been growing faster than either passenger car or bus transport.

Challenges and forecast demands:

- Some regional rail lines carry larger volumes of freight. Funding of these lines appears to be higher than other regional lines and, as a result, they have a lower risk of **under-maintenance**.
- Much of the infrastructure is nearing the end of their useful life and facing many **maintenance/renewal issues** including:
 - Replacing wooden sleepers with steel or concrete sleepers; and
 - Renewing timber bridges to strengthen the rail bridge network.

Singapore:

Singapore faces challenges such as **limited land for developments** including land for road developments. The major contributing factor to this challenge is the parallel increase in resident's population and number of vehicle over the years. Hence, the increasing population continues to impose travelling demands on its limited land for developments.

While Singapore has successfully **built new roads to cater for the public demands**, the situation remains. Thus, more roads constructed also increase users and cars as the population continues to grow. In alleviating the situation and minimizing the effects of this challenge, the Singapore government came up with **new measures** to run its road/transport system. These measures are considered sustainable, affordable and inclusive.

i. Modes of Transport:



Light Rail Transit (LRT)

adding more bus trips during afterhours and early hours of the day.

MRT and LRT lines are built and managed by Singapore Land Transport Authority. Profit-based corporations (SMRT Corporation & SBS Transit) are responsible with operating concessions from Singapore LTA, and, operate and facilitate public transport services.

The most common modes of transport for Singapore are Mass Rapid Transit (MRT), Light Rail Transit (LRT), Buses and Taxis. The Singapore government has then prioritized expanding and extending public transport to ensure that public commuter services are efficient and timely. In extending public transport, Singapore aims to add more MRT and LRT routes and stations, as well as



Mass Rapid Transit (MRT) - Routes & Stations

ii. Area Licensing Scheme:

In 1975, Singapore successfully launched its **Area Licensing Scheme (ALS)** which aims at **charging private vehicles travelling into the CBD**. This positively causes the drop in the number of private cars that entered the CBD zone, while supporting the use of public transport. Singapore initially targeted the urban areas as it was the only crowded zone back in the 20th century. However, the scheme helps the country in terms of creating more similar schemes that are practiced today.

iii. Vehicle Quota System:

With the increasing number of imported cars and demand, the Singapore government through the Land Transport Authority introduced the **Vehicle Quota System**. This program or system permits LTA to register family or individual vehicles by issuing ownership license. Any vehicle that is imported into Singapore will have to go through this system to register for ownership and acquire a Certificate of Entitlement (COE). Every car owner is given a COE that

is valid for **10 years**. After 10 years, the owner is obligated to deregister the vehicle, or renew its COE for only an additional 5 years.

This system is used by Singapore to control growth of vehicle numbers by limiting registration period and determining COE price. The process of acquiring a Certificate is not simple, as people can only be given one Certificate. COE holders are then required to bid with other people in obtaining a certificate. Therefore, if you want to own a car for 10 years, you have to bid for ownership, if not you will have to wait for another bidding scheme. The COE process is illustrated in the chart below;

iv. Electronic Road Pricing (ERP):

Similar to ALS, Singapore has also established the **Electronic Road Pricing system** to control the number of vehicles on congested areas during peak hours of the day. Singapore LTA through this measure charged vehicles during peak hours on overcrowded areas, depending on the type, size and time the vehicle enters the ERP zone. Understandably, the bigger vehicles paid the highest fine.

This has prompted people to change travelling routes, travelling time and mode of transport for the most part. Behind ERP, Singapore secretly promotes the use of public transport to minimize congestion. Using public transport has now been the most common and preferred mode of travel to work and at any hour. Electronic Road Pricing offers people discount if they reached the ERP gantry before 7:30am and after-hours at night.

New Zealand:

In NZ today, there are more and more people using the land transport system than in the previous years. This is a result of new improved technologies, great services and operators, as well as walking and cycling. All of these have created new challenges for the transport agency as they strive to achieve a safe system and avoid accidents, which have costs the agency millions of dollars every year. With this constant increase, the demand soars higher, challenging the transport agency's ability to cater and cope.

Below are the main issues faced by the NZ Transport Agency:

- **Growth in transport demand** due to increase desire for mobility as household incomes increases. There is also a strong growth in freight tasks and business services as the economy develops and community population increases.
- **Increased congestion on road networks** resulting from general preference for travel by private motor vehicles, growth of dispersed communities. These

are leading to the private car becoming the dominant transport mode, and increased travel frequency to access employment, education and social amenities.

- **Negative impacts on the environment** and communities resulting from:
 - Growth in emissions, contaminants, noise and waste pollution from increasing road vehicle use;
 - Air pollution causing respiratory illnesses and increased dependence on motor vehicles, which is affecting physical fitness;
 - Increased frequent and severe unplanned disruptions due to a combination of climate change, increasing traffic volumes and incidents such as crashes; and
 - NZ's transport contributes to 18% of its greenhouse gas emissions, with which 90% of that 18% emerges from road transport.

Responding attempts:

- **Building new road capacity** to meet demand;
- Providing **increased subsidies for public transport**;
- Managing risks and resilience challenges, helping communities recover from disruptions;
- Mitigating the environmental impacts through **increasing expenditure on landscaping and tunneling of roads**. This is known as the '**predict and provide**' approach;
- i) **People-Centric Approach**: encourage a shift from single-occupancy vehicles to a broader variety of affordable and attractive travel options, such as buses, trains, ferries and active modes such as walking and cycling.

PART 3: ANALYSIS & CONCLUSION:

Samoa's road transport network makes a crucial contribution to its economic, social and environmental development. However, there are always challenges associated with developments to Samoa's overall transport system just as other jurisdictions/countries are currently experiencing. The increase in congestion on road networks resulted from the constant increase in the number of vehicles being imported into the country. With the current trend of increased imported vehicles, Samoa's transport system is already stretched beyond its limitations. In lieu of these challenges, the following mitigating measures are suggested.

Control Measures:

The Land Transport Authority had introduced **parking meters** in 2018 as a control measure to help alleviate overcrowding of public parking spaces, and minimize traffic congestions in some designated areas in town. As observed, people are getting used to the concept however, monitoring should be strictly enforced. This requires manpower and new technology such as introducing CCTV cameras. The Ministry of Police, who took over the transport roles and functions of the LTA in mid-2019 as per Cabinet Directive, is aiming to install more parking meters along every street and road in the Apia city CBD.

Alternatively, the Singapore government had introduced various control measures to alleviate challenges they foresee will impact the future of its road transport networks, which have functioned effectively as explained earlier. The introduction of **Area Licensing System** has effectively decreased the number of vehicles entering the CBD of Singapore, whilst supporting/strengthening/emphasizing the use of public transportation i.e. public buses, taxis. **Electronic Road Pricing** put cost to the people to either change travelling routes, travelling time or else prefer public transportation. The introducing of **COE** has also controlled the growth of vehicles by limiting the period allowed for a vehicle to be owned. These measures has attracted many commuters to use public transportation.

Samoa should also start considering and adopting new control measures in a sustainable, affordable and inclusive manner to avoid future challenges to our road/transport system. We can always start with the examples of Singapore, adopting a few or all if necessary.

Improve road infrastructure and transport system:

Government should also look into innovative ways to improve and expand our road infrastructure, to meet the future demand from transport services. At the heart of any such development is ensuring the security and wellbeing of our country. New Zealand and Australia have moved into expansion and building

of more **access roads** and **freeways**, to mitigate effects of road congestion. Improving speed, reliability and frequency of public transport services have also been encouraged.

The ongoing Climate Resilient Transport Project is focusing on building resilience in Samoa's road infrastructure such as improvements made for the West Coast Road towards Faleolo Airport. Conversely, critical findings from the project as stated has indicated that sea level will continue to be an ongoing threat to Samoa's coastal roads. Sea level will continue to rise in a range of 5 – 15cm by the year 2030. It is also believed that storm surges, sea level rise, heavy rainfall and landslides will continue to impose huge cost to Government on road maintenance, unless an alternative, innovative and friendly plan is developed.

The future:

As Samoa enters the new decade, the focus on road development should be strengthened with more emphasis on the development of a new transportation system network. This network should consider with utmost care from a more transformative, sustainable and holistic approach. The strategic outlook is to construct more inland roads that will in turn entice those living on the coastline to move further inland and away from the impacts of climate change. Conversely, this will go hand in hand with the current road development initiatives (upgrading and maintenance) undertaken by the Samoa LTA.

The development of a strategic Transportation Plan of Action is paramount. Such a Plan of Action will not only look at developing and upgrading the current transportation network in Samoa, but also identify relevant areas where highways, motorways or railroads could be constructed in the future. This 5-10 year plan will respond to the Samoa 2040 vision of Government and will look at constructing the necessary transformative transportation developments needed for ease of traffic connectivity from the southern part of Upolu towards its western areas. A similar plan should also be identified for Savaii. The plan will also look at developing and constructing alternative and or new transportation systems within the Apia CBD and towards the Vaitele Industrial Area, Faleolo Airport and Inter Island Ferry. This should extend towards the south east of Upolu where most of our tourist attractions are located.

Furthermore, the plan of action should put more emphasis on the construction of freeways/motorways and railways that will lead to a more holistic development of Samoa's transportation network. Public transportation is a critical component of such developments and as such more improvements and advancements should be made to further develop this area. A sustainable public transportation system (*buses, possibility of constructing railways, electric buses, and trains, taxi's*

and others) presents many economic and environment benefits for Samoa in regards to reducing traffic congestion vis-à-vis number of commuting vehicles preeminently within the Apia CBD area, which will in turn afford Samoa with a transformative economy, and one that is eco-friendly in relation to carbon emissions.

Also, this plan should also take into account the new technological advancements in transportation used by other developed countries; such as those given in this paper. The plan therefore must identify the necessary practices, technical skills and infrastructural knowledge that will suit Samoa's context, in regards to its efforts in developing, and upgrading its transportation system/network.

The development of a more transformative transportation system aligns directly to Samoa's core development priorities as outlined in the Strategy for the Development of Samoa (SDS). It also goes hand in hand with the Samoa 2040 initiative, as transportation development will also assist in the development of the key identified sectors that will bring about new and sustainable economic changes and opportunities in the next 20 years. Most importantly, ensuring that our people are protected, informed and secured is paramount.

RECOMMENDATIONS:

In light of the above analysis, this research paper recommends that the Samoa Land Transport Authority (LTA) develop a Strategic Transportation Plan of Action that will entail the following;

1. **Development of new inland roads across Samoa with the possibility of constructing more effective transport systems such as highways, tunnels and motorways**
2. **Improvements in the modes of transportation across Samoa, with a clear indication of and way forward for the construction of highways/freeways, railways that will improve public transportation, electric buses and others that will add value to Samoa's transportation system development;**
3. **Ensure that parking meters within the Apia CBD are installed around all business areas and ensure that they are well maintained and effective via CCTV/Cameras that will be stationed within these areas for monitoring of offenders;**
4. **The installation of CCTV cameras on traffic lights and around all parking meters within the Apia CBD for monitoring and security/policing purposes.**
5. **The construction of sustainable and eco-friendly bridges that can connect all islands of Samoa as another mode of transportation, apart from the commuter ferry currently used, to and from Savaii and Upolu;**
6. **Development of an effective vehicle waste management service/system that will address the problem of vehicle waste which is predominantly identified and seen around Samoa;**
7. **In collaboration with other relevant Government Agencies (MWTI, MNRE, MOF, MWCSD, SBS, Attorney General), undertake a feasibility study that will accurately determine the viability of the suggested project to be undertaken. Such a study should be thoroughly planned and analyzed, taking into account the critical areas that are required of a complete feasibility study i.e. Technical, Economic, Legal, Operational and Scheduling;**

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