

# ELECTRONIC TOLLING

## North American Study

**FREE  
ABSTRACT**

The reference  
report on North American  
Road User Charging



*Bridging the environmental gap*

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PTOLEMUS Consulting Group

# About PTOLEMUS Consulting Group



# The first strategy consulting & research firm entirely focused on augmented mobility & automation

## Strategy consulting services

Strategy  
definition

Investment  
assistance

Procurement  
strategy

Innovation  
management

Business  
development

Project  
management

## Market research services

Off-the-shelf  
reports

Subscription  
services

Custom  
market  
research

## Fields of expertise

### Mobility services

Car pooling  
Car sharing  
MAAS

Micro-mobility  
Ride hailing  
Shared mobility

Smart parking  
Tax refund

### Vehicle services

bCall  
eCall  
FMS  
SVT / SVR

Tracking  
VRM  
In-car Wi-Fi  
Parking

Navigation  
Speed cameras  
Traffic information

### New energies

BEV  
EV charging  
Fuel cards

Fuel cells  
Hydrogen

PHEV  
Vehicle-to-grid

### Usage-based charging

Car As A Service  
Electronic Toll  
Collection

Mobility-as-a-  
Service  
RUC

UBI / PAYD  
Vehicle rental  
Vehicle leasing

### Vehicle data & analytics

AI  
CAN-bus  
Crowd-sourcing  
Data protection

Driving behaviour  
OBD  
Predictive  
analytics

Remote  
diagnostics  
xFCD

### Vehicle automation

ADAS  
Autonomous cars

Autonomous  
trucks

Robo-taxis  
Shuttles

### Enabling technologies

Positioning (GNSS  
/ WiFi / cellular)  
M2M /  
connectivity

Smartphones  
Sensors

Telematics  
devices  
V2X

# We serve 320 clients across the mobility ecosystem

## Analytics, maps & applications providers



## Automotive manufacturers & suppliers



## Telematics solution providers



## Mobile telecom players



## Fleet & fuel, ITS & regulators



## Device & location suppliers



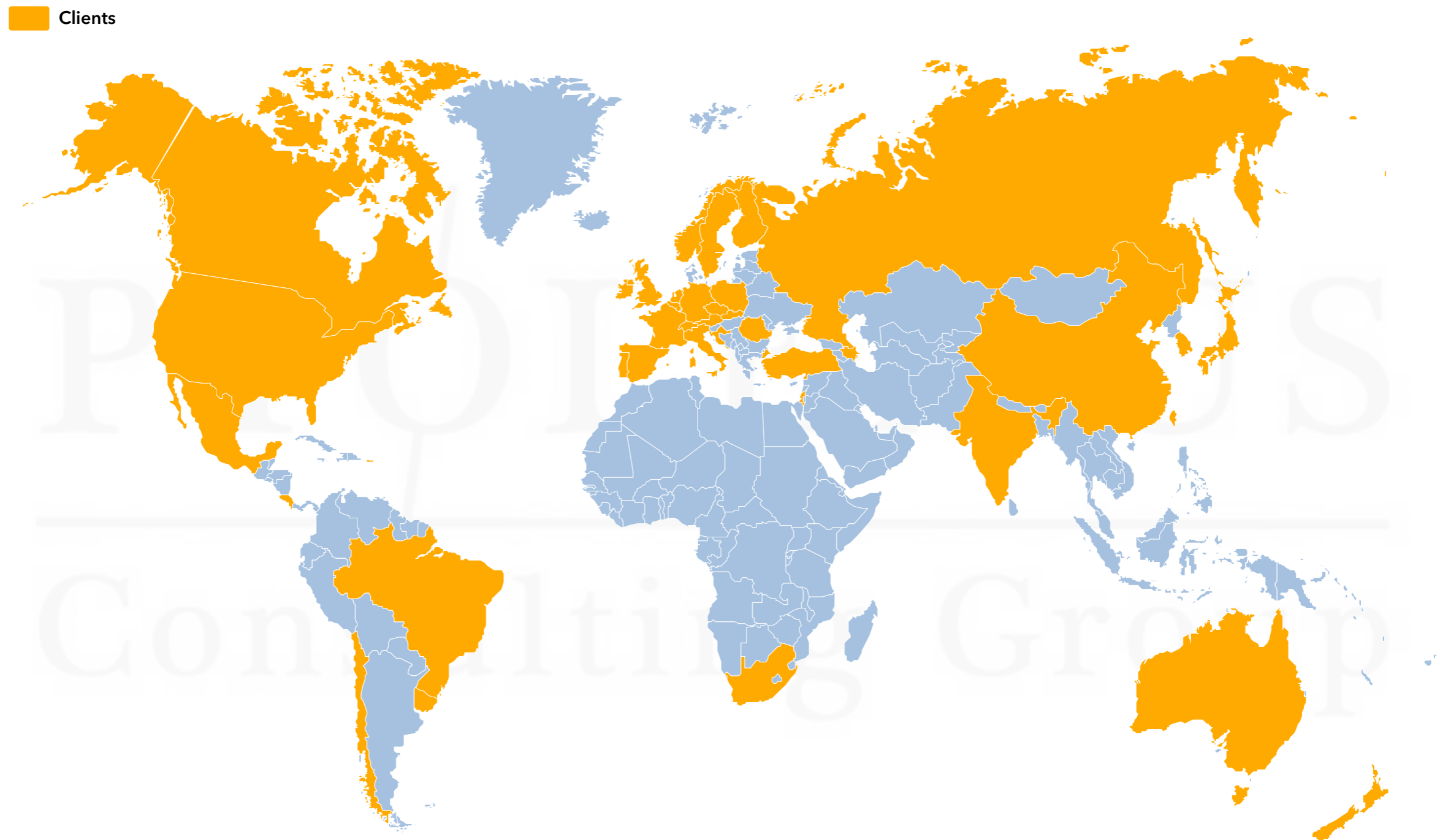
## Insurers, aggregators & assistance providers



## Banks & private equity investors



**Our team of consultants, experts & analysts consisting of 10 nationalities helps our clients worldwide**



# 35 assignments to help our clients define & implement their ETC and RUC strategies



For the Wallonian road operator, evaluated the feasibility of a shadow tolling scheme



Evaluated GNSS heavy vehicles tolling solutions and assessed building blocks and barriers

Major road operator



Defined & implemented its partnership strategy in the connected vehicle ecosystem

Future EETS provider



Identified market opportunities & defined strategic plan in connected mobility services

Road & infrastructure operator



Defined toll pricing strategy & marketing plan across Europe

Future EETS provider



Assisted the board of its technology unit in its strategy definition

Global motorway operator



Evaluated the technologies & business potential of the EU electronic tolling market



Defined its global data & analytics strategy to predict incidents

Major road operator



Helped a major EETS provider redefine its strategy and go-to-market plan

EETS provider



Conducted the strategic review of its mobility services business

Major road operator

# We help all stakeholders define their e-tolling strategies...



Benchmarked the European market for ETC, fuel card & tax refund services

Major fuel card provider



Advised on the optimal structuring of the truck tolling scheme



Ministerie van Infrastructuur en Waterstaat



Defined its strategic positioning in the field of fleet connected vehicle services



Built company strategy, value proposition & go-to-market plan in fleet mobility services

Global electronic tolling supplier



Assisted in forging partnerships in EU connected vehicle ecosystem

Global ETC system provider



Understand the trends of the commercial road transport & payment markets

Group of energy companies



For a major European toll charger, forecast the tolling & ETC markets in 42 countries

Global ETC system provider



Detected opportunities from connected & autonomous vehicles for the space industry

Space agency



Defined its entry into the European ETC market

Automotive tier-1 supplier



Helped the fuel card business unit the impact of key mega-trends in fleet services on their strategy

European oil company

# Our experience of due diligence, market sizing & business planning in ETC and fleet services



Led the technology due diligence of Arvento, the leading Turkish fleet management service provider

INVESTCORP



Conducted the due diligence of a major toll service provider

Private equity fund



For its fleet, evaluated the benefits of telematics and scheduling solutions

EUROMASTER



Assisted in the strategic & technology evaluation of an Irish fleet Telematics Service Provider

Motorway operator



Evaluated future changes in the European fleet services market

Fuel card services group



Helped evaluate European OBD market opportunities in fleet services

Major telematics device vendor



Defined our client's strategic plan in the field of connected fleet services

Major motorway operator



Defined the European pricing strategy for FMS, fuel card services, tolling & tax refund

Fleet services provider



Led commercial due diligence of ITmobile, a Belgian fleet TSP

FleetComplete



Led technology due diligence of Lytx, a US video-based fleet Telematics Service Provider

BainCapital



Define its 5-year US fleet services strategy & go-to-market plan

Global fuel card company



Helped define the insurance and fleet management specifications of its eCall on-board unit

Global automotive OEM

# PTOLEMUS can help your organisation define and achieve its strategy in fast moving times

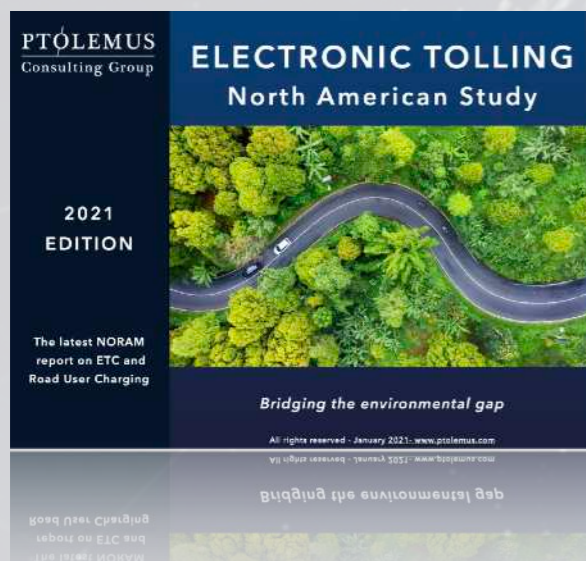
- 
- **Strategy definition**
    - Road policy strategy assistance
    - Market entry assistance
    - Data strategy and analysis
    - Mobile tolling strategy development
    - Multimodal mobility design and planning
    - Future vision of vehicle payments
    - Strategy orientation workshops
  - **Innovation strategy**
    - Vertical market assessments
    - Product definition
    - Consent management
  - Data analytics strategy
  - **Innovation delivery**
    - Proof of concept design & launch
    - Architecture definition
    - Project management
  - **Investment assistance**
    - M&A strategy
    - Commercial due diligence
    - Technology due diligence
    - Feasibility studies
    - Vehicle data market sizing
    - Business case development
    - Cost benefit analyses
    - Post-merger integration
  - **Procurement**
    - Definition of road charging schemes
    - Assistance to tenders
    - Selection and sourcing of ETC technology
  - **Business development**
    - Partnership strategy definition
    - Assistance to tender response
  - **Project management**
    - Assistance in management of road pricing projects
    - Congestion charge project management

PTÓLEMUS Consulting Group

# About the North American ETC report



# The most comprehensive report on electronic tolling and road user charging



*More than just market research.*

*A strategic analysis on the future of road pricing and environmental standards*

- An **update to our 2018 Electronic Toll Collection Global Study** providing an all-encompassing overview and outlook on the electronic tolling market in North America
- A **370-page analysis of the North American electronic tolling landscape** based on:
  - 9 years of constant market surveillance
  - 6 months of desk research by a team of 7 consultants
  - 35 strategy consulting assignments in the ETC domain
- An **in-depth review of 2 countries that operate tolling in North America** with traffic volumes, technology, model, size and revenues projections
- A **comparative assessment of all tolling technologies**:
  - Deployment models and impacting trends for ANPR, DSRC, Infrared, GNSS and RFID
  - Assessment of emerging technologies including fleet telematics devices, smartphones, and connected car payments
- Forecast of the technology mix
- An **in-depth assessment of North America including**:
  - Introduction to the market including legislation and major infrastructure campaigns
  - Forces and models shaping interoperability
  - Review of current and future projects
  - Value chain and presentation of major local players
  - Technology roadmap
  - Country profiles for the major tolling domains
- **2020-2030 bottom-up market forecast**
  - North American scope: **2 countries investigated in detail**
  - **Projections** of the toll and electronic toll market in North America: toll revenues, subscription volumes, share of ETC, key influencing factors
  - An Excel file with **subscription volumes by technology** and vehicle type, devices sold, total revenues collected and ETC-only revenues collected

# The report was written by an international team of 7 experts



**Frederic Bruneteau**  
Managing Director, Brussels

The **founder** of PTOLEMUS, Frederic has accumulated **25 years of experience of the mobility and transport domains** and 15 years of strategic and financial advisory.

He has become **one of the world's foremost experts of connected car services & automation** and is interviewed on the subject by publications such as the *Financial Times*, *Forbes*, the *Wall Street Journal* and *The Economist*. He has also spoken at over 40 conferences on the subject.

**Within PTOLEMUS, Frederic has led 150 consulting projects and helped many world leaders define their strategy and implement it including:**

- **Road operators and ETC solution providers** including Abertis, A-to-Be, Axxès, Brisa, Ferrovial, Egis, Kapsch, Sofico, Transurban, T-Systems / Satellic, Q-Free, etc.
- **Fleet services providers** including AGC, Arvento, Astrata, Bridgestone, BP, Danlaw, DKV Euroservice, Easytrip, ENI, Fleet Complete, Nationwide Insurance, OMV, Routex, TomTom and WEX.
- **Automotive OEMs and their tier-1 suppliers:** AAA Data, AGC Automotive,

Bridgestone, Allianz Partners, AXA Partners, Cihon, CNH Industrial, Coyote System, Europ Assistance, HERE Technologies, Michelin, Scania, Telit, TomTom, Toyota and wejo.

- **Some of the world's most prestigious telematics / analytics suppliers:** Alfa Evolution (UnipolSai), Arvento Mobile Systems, Danlaw, DriveFactor, Eliocity, Fleet Complete, LexisNexis / Wunelli, Mobile Devices, Movelo, Octo Telematics, Orion, Pioneer, Qualcomm, Sentiance and Vodafone Automotive.
- **Financial investors** including Advent International, Amadeus Capital Partners, Amundi, Apax Partners, Atlantis Vest, Bain Capital, Baupost Group, Capvis, Cinven, CIP Capital, Crédit Agricole, CVC Capital Partners, Disruptive Capital Partners, Hellman & Friedman, Hutton Collins, Intek Group, Investcorp, Leonardo & Co, Montezemolo & Partners, Pamplona, Renova Group, Rothschild Capital Partners, Silver Lake Partners, Tantalum and Time for Growth.

**Frederic, who contributed to the 2 previous versions of this study, performed a complete review of this report.**



**Andrew Jackson**  
Research Director, London

With a career in market research spanning 12 years, **Andrew has over 8 years of experience working in the automotive and industrial sectors for companies** such as Datamonitor, EurotaxGlass and JATO Dynamics;

He has delivered **advisory services, custom projects, data and insights for some of the biggest names in the automotive OEM and OES sectors**, including: BCA, Continental, CNH Industrial, Delphi, Johnson Controls, Hyundai, LeasePlan, Mannheim, Mercedes Benz, Mobis, Philips Automotive Lighting, PSA, SEAT, Tenneco and Volkswagen.

Over the years, he has been sought to share his opinion via a variety of publications such as the *Financial Times*, the *Wall Street Journal* and *Automotive Industries*, *AMonline*, *Fleetworld* and *Fleet News* as well as a variety of national newspapers. He is also interviewed on global automotive events by Bloomberg, CNBC and Reuters.

**A Certified Member of the Market Research Society (CMRS)** Andrew directed the research and entirely reviewed this report.



**Marissa Burkett**  
Consultant, Paris

Marissa has more than **5 years of experience** in management consulting for organisations such as Advent International, AGC Automotive, Apax Partners, Axxès, CIP Capital, Eagle Hill Consulting, GSGroup, Nationwide Insurance, the Netherlands' Department of Transport, OMV, Q-Free, Transurban, the United Nations, USAid, the US Federal Acquisition Service.

Marissa started at PTOLEMUS as a contributor to the previous ETC Global Study, with a focus on North America.

Since then, she has become the PTOLEMUS in-house ETC expert and led the research team for this report.

**Marissa led the research, analysis and writing of this report.**

# The report was written by an international team of 7 experts



**Nina Neubauer**  
Business Analyst, Brussels

An urban planning and transportation engineering graduate, Nina has developed expertise in **Autonomous Vehicles (AVs), Electronic Toll Collection, Smart Cities and connected cars** by assisting companies such as AXA Partners, Bain Capital, Advent International, Baumarc Project, kasko2go and Vodasun Energie.

She has completed several research projects related to **traffic management and engineering** for the AVL Motor Test Center AB in Gothenburg and within the TU Munich.

For a global roadside assistance operator, she helped defining a **connected car service**

**strategy** and built a **market forecast of 7 connected car services markets** in Europe.

For a private equity firm Nina conducted market research on the **European electronic tolling market** regarding global business and regulatory trends.

She has built our **2020-2030 global automotive market forecasts** and contributed to our **Connected Vehicle Payments Global Study**.

**Nina built the market forecast model for this report.**



**Jacopo Scudellari**  
Research Analyst, Brussels

A graduate of urban and mobility planning from Politecnico di Torino, Jacopo has developed expertise in **Electronic Tolling Collection (ETC), congestion charging, and electric vehicles (EVs)** by assisting companies such as Advent International and Hitachi Automotive Systems.

He has gained knowledge of state of the art of the **European and Asia Pacific ETC market**, the main tolling systems currently adopted and the technologies in use while updating the third edition of the ETC Global Study.

He has also **appraised the US electric vehicle market** for a company engaged in the development, manufacture, sales and services of automotive components.

Before joining PTOLEMUS, Jacopo worked for the Politecnico di Torino, Turin, carrying out **research work about the spatial impacts of the diffusion of Autonomous Vehicles (AVs)**.

**Jacopo worked on the European and Asia Pacific sections.**



**Victor Lerin**  
Business Analyst, Paris

A French-Japanese citizen, Victor obtained a MBA in Business Intelligence in 2018 specialising in open source intelligence, mapping business ecosystems and consultancy work. His final project consisted in producing an in depth study and analysis for a consortium of scientific research institutes (**CVT Allenvi**) to make recommendations on strategic positioning in the field of resilience and smart cities.

Furthermore, he also gained business knowledge by working as the Anti Illicit Trade Advocacy Officer at the **European Chamber of Commerce in Myanmar**

(**EuroCham**). Victor elaborated the strategy for the second edition of the Anti Illicit Trade Forum in held in the capital city of Nay Pyi Daw. His mission was to strengthen dialogue and cooperation between the Myanmar Government and European companies operating locally such as **Unilever, Heineken, Carlsberg, Pernod Ricard, British American Tobacco, Luther Law Firm and Metro**.

**Victor worked on the African and Asia Pacific sections.**



**Solène Pinel**  
Business Analyst, Brussels

Solene completed her Grande École programme at **EDHEC Business School**. Her **MSc. in Strategy, Consulting and Digital Information** enabled her to acquire essential skills to succeed in the domain of strategy consulting in connected mobility markets.

Prior to joining PTOLEMUS, Solene was part of the SMB (Small & Medium Businesses) team within **Microsoft** France, where she provided guidance and made recommendations on the **strategic actions** required to drive customer acquisition. She also drafted a **detailed assessment of competitive the environment landscape**.

She then moved to **Singapore**, where she worked for a start-up specialised in 3D printing services. She was responsible for **delivering and executing the company's digital strategy**, with a specific focus on the **website revamping and marketing campaigns**.

Within PTOLEMUS, Solene has participated in the launch of the **Connected Vehicle Payments Global Study**.

**She led our research into the North American market.**

# The study answers key strategic questions

What technology and model will be used in North America in 2030?

Where are the main opportunities to invest in surface infrastructure?

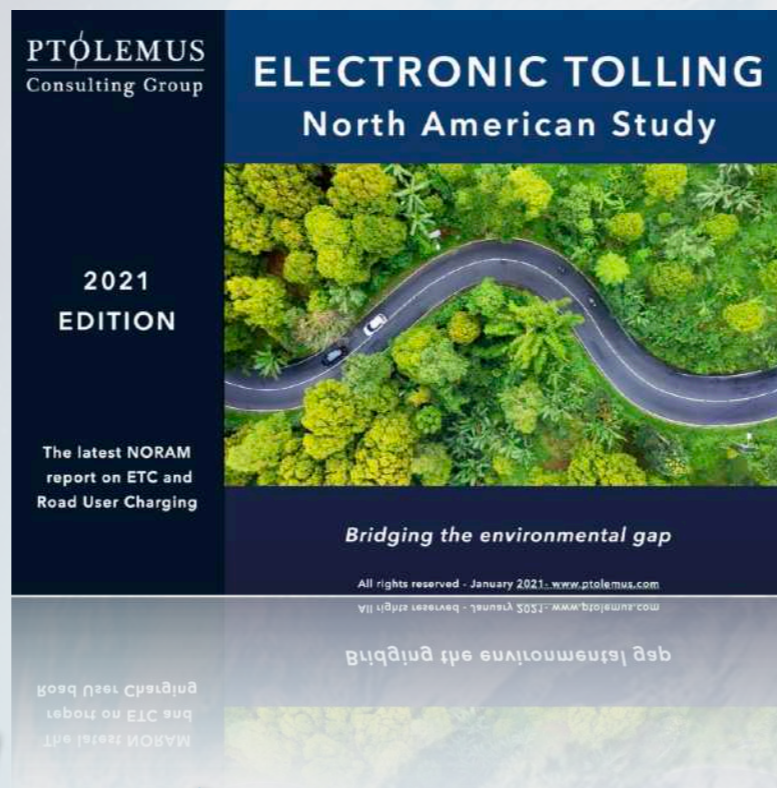
What will be the split between manual and electronic toll payments in 2030?

Is the US ready to implement road usage charging (RUC)?

Will new technologies help drivers accept tolling?

Will multi-lane free flow tolling become the new normal?

Will toll devices disappear?



What is the impact of interoperability programmes on toll chargers and service providers?

How does data help providers expand their service offerings?

Which OEMs are implementing connected toll payment?

How are toll service providers addressing the growth of smartphone use?

How can toll service providers protect their market share against new entrants?

## 1. Fundamentals of electronic tolling and road user charging

- History, definitions, applications and use cases
- Global overview of technologies and schemes

## 2. Trends impacting the ETC ecosystem

### A. Major political, technological, and market drivers

- Political drivers overview and impact
- Technological drivers overview and impact
- Market drivers overview and impact
- Driver assessment by region

### B. The impact of COVID-19

- COVID-19 response map
- Traffic volumes and recovery
- Impact on ETC penetration

### C. Tolling as a service within mobility payments

- Expansion of toll service offering
- Entrance of mobility service providers and navigation giants into tolling
- Services and payment use cases in the connected car

### D. The alignment of road user charging and environmental policy

- The United States and road user charging
- Tolling types and their effects on emissions
- Congestion charges and Low

Emission Zones (LEZ)

## 3. Traditional and emerging devices and technologies

### A. Global technological overview

### B. Technology in detail

- RFID
- DSRC
- GNSS
- ANPR
- Infrared
- Mobile
- Fleet telematics
- Embedded

## 4. The ETC value chain and power players

### A. The ETC value chain explained

- Value chain integrators
- Device manufacturers
- Active toll chargers
- Service operators
- Systems specialists
- Active and passive smartphone platforms

### B. ETC power players

- The traditional players

- Road operators
- Toll service providers
- Fuel card issuers
- Energy companies
- Fleet management service providers
- The new entrants
  - Fleet telematics providers
  - OEMs
  - Navigation giants
  - Payment providers
  - Mobility service providers
- How new entrants will shake up the market

## 5. Services beyond tolling with dynamic data

- Data collection and its usage

## 6. Electronic tolling assessments by country

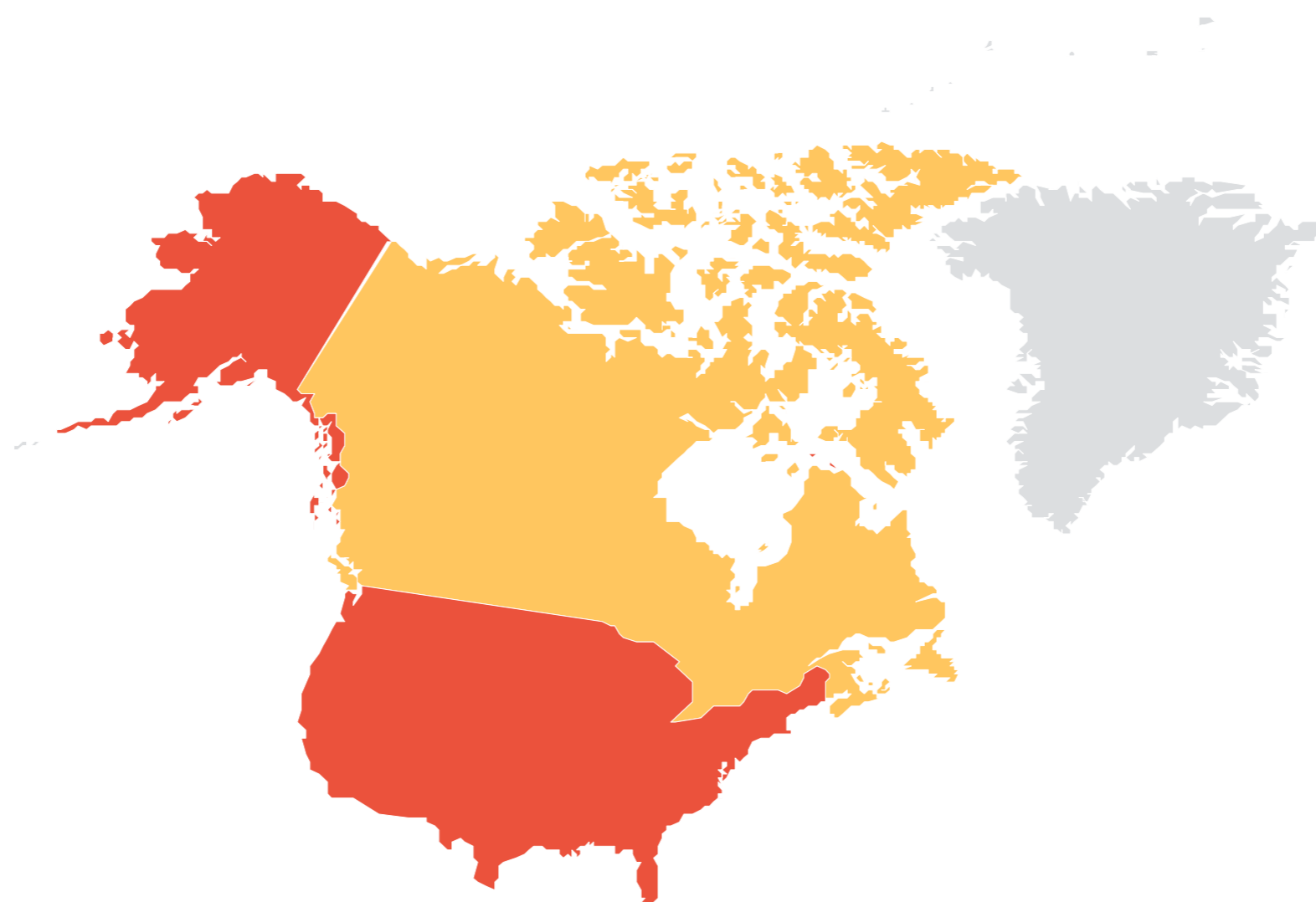
- Regional overview
  - Introduction to the region
  - Legislation
  - Potential areas for investment
  - Regional value chain
  - Major local players
  - Technology roadmap
  - Efforts at interoperability
  - Market forecast
- Country profiles
  - Canada
  - US (including assessment of 14 US states)

## 7. North American outlook: the future of ETC and RUC

# Across the report, we deliver qualitative and quantitative insight into the United States (US) and Canada

## Report coverage

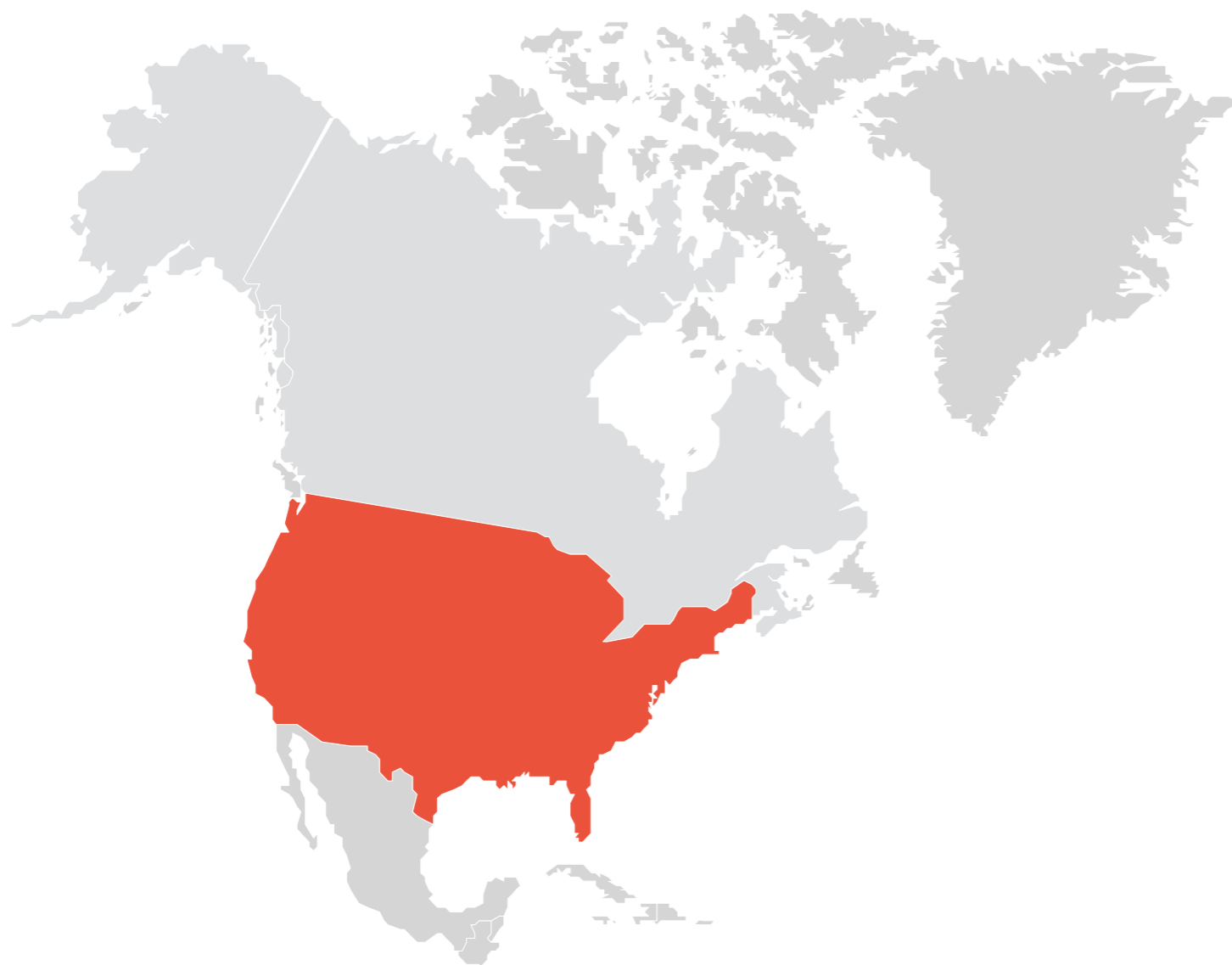
- United States (US)
- Canada



# The report contains profiles of 2 key North American countries...

<b>North America</b>	Belgium	Ireland	Sweden	Malaysia
Canada	Bosnia & Herzegovina	Italy	Switzerland	New Zealand
USA	Bulgaria	Latvia	The Netherland	Philippines
<b>Latin America</b>	Croatia	Lithuania	Turkey	Singapore
Argentina	Czechia	Norway	UK	South Korea
Brasil	Denmark	Poland	Ukraine	Taiwan
Chile	Estonia	Portugal	<b>Asia-Pacific</b>	Thailand
Colombia	Finland	Russia	Australia	<b>Africa</b>
Mexico	France	Serbia	China	Kenya
<b>Europe</b>	Germany	Slovakia	India	Morocco
Austria	Greece	Slovenia	Indonesia	South Africa
Belarus	Hungary	Spain	Japan	Uganda

## ...and 14 individual states specifically in the USA



**United States of America**



California



Minnesota



Colorado



Oregon



Delaware



Pennsylvania



Florida



Texas



Georgia



Utah



Hawaiï



Washington



Indiana



Wyoming



# The report mentions more than 65 companies (1/3)

Company	Country	Type	Company	Country	Type	Company	Country	Type
407 ETR	Canada	Toll road operator	Caltrans	USA	Transportation Authority	Express Toll	USA	Service provider
Alliance for Toll-Free Interstates (ATFI)	USA	Association	Central Texas Regional Mobility Authority	USA	Toll operator	ExxonMobil	USA	Petroleum company
Amazon	USA	Technology company	Chevron	USA	Petroleum company	Fastrak	USA	Service provider
Apple	USA	Technology company	Cofiroute	USA	Concessionaire	FASTTag	USA	Service provider
ATI	USA	Association	Comdata	USA	Fleet management service provider	Federal Highways Administration	USA	Federal transportation agency
Automatic	USA	OBD dongle service provider	Conduent	USA	Technology company	Federal Motor Carrier Safety Administration	USA	Federal agency
Autopay	USA	Auto loans service provider	Confidex	Global	Mobility service provider	Feig Electronic	USA	Technology company
Avis	USA	Rental car company	Cubic	USA	Transportation company	FleetCor	USA	Service provider
Azuga	USA	Device and equipment supplier	e pass	USA	Service provider	Fleetio	USA	Fleet management service provider
BancPass	USA	Service provider	E-ZPass Group	USA	Toll operator	FleetPride	USA	Automotive supplier
BestPass	USA	Service provider	EastLink	Canada	Telecom company	Florida Department of Transportation	USA	Transportation Authority
Blueridge Transportation Group	USA	Transportation company	Egis	Global	Toll operator/ Service provider	Florida Turnpike Enterprise	USA	Toll operator
BP	USA	Fuel company	Electronic Transaction Consultants Corp.	USA	Service provider	Ford	USA	Automotive OEM
California Department of Transportation	USA	Transportation Authority	Enterprise	USA	Rental car company	Fuelman	USA	Fuel card provider

## The report mentions more than 65 companies (2/3)

Company	Country	Type	Company	Country	Type	Company	Country	Type
GeauxPass	USA	Service provider	Kapsch TrafficCom AG	Global	Device and equipment supplier, system integrator and concessionaire	OmniAir	USA	Association
General Motors	USA	Automotive OEM				Oracle	USA	Technology company
Gentex	USA	Automotive supplier	MAC PASS	Canada	Toll service provider	Oregon Department of Transportation	USA	Transportation Authority
Geotab	Canada	Fleet management service provider	Mack	USA	Automotive OEM	OSI	USA	OSI systems company
GeoToll	USA	Mobile application service provider	massDOT	USA	Government institution	Optoelectronics	USA	Service provider
Go PASS	USA	Service provider	Mastercard	USA	Payment service provider	Palmetto Pass	USA	Service provider
Good to Go	USA	Service Provider	Maven	USA	Technology company	PayByPlate	USA	Service provider
Google	USA	Technology company	McDonalds	USA	Fast food company	PayTollo	USA	Service provider
I-95 Corridor Coalition	USA	Association	Microsoft	USA	Technology company	PeachPass	USA	Toll operator
IBI	Canada	Systems provider and integrator	MnPass	USA	Service provider	Pikepass	USA	Toll operator
IBTTA	Global	Toll associtaion	NationalPass	USA	Service provider	PlusPass	USA	Service provider
IMS	Canada, USA	Service provider	Navistar	USA	Automotive OEM	Quickpass	USA	Service provider
InsideEVs	USA	Electric car service provider	Neology	San Diego US	Device and equipment supplier	Raytheon	USA	Technology company
K-Tag	USA	Service provider	Northwest Parkway	USA	Toll operator	Rivian	USA	Automotive OEM
						Schneider Electric	Global	Integrator
						Shell	Global	Energy company
						Statefarm	USA	Insurance company
						Sunpass	USA	Service provider
						Teletrac Navman	USA	Fleet telematics providers

## The report mentions more than 65 companies (3/3)

Company	Country	Type	Company	Country	Type
Telit	Global	Technology provider	<b>Verizon Telematics</b>	USA	Telematics service provider
Texas Department of Transportation	USA	Transportation Authority	<b>Verra Mobility</b>	USA	Transportation Authority
The Toll Roads	USA	Service provider	<b>Visa</b>	USA	Payment service provider
Toll Tag	USA	Service provider	<b>Washington State Department of Transportation</b>	USA	Transportation Authority
Total	Global	Energy company	<b>Wex</b>	USA	Fleet management service provider
TransCore Inc.	USA	Device and equipment supplier	<b>WSP</b>	Canada	Professional service company
TxTAG	USA	Service provider	<b>Xevo</b>	USA	Telematics company
U.S. Bank	USA	Bank			
Uber	USA	Mobile application			
United States Department of Transportation (USDOT)	USA	Federal agency			
<b>Uproad</b>	USA	Payment application			
<b>Verdeva, Inc</b>	USA	Payment application			
<b>VeriToll</b>	USA	Tolling as a Service operator			

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# Trends impacting the ETC ecosystem



# Electronic road tolls currently exist in the US and Canada

Electronic tolling scheme in place, 2020



- For the **total of electronic tolled roads**, the **US and Canada** apply **electronic tolling to all vehicle types**
  - Very few or no tolled roads apply tolling to a certain type of vehicles only.

# We expect electronic tolling schemes to remain similar in the next 5 years

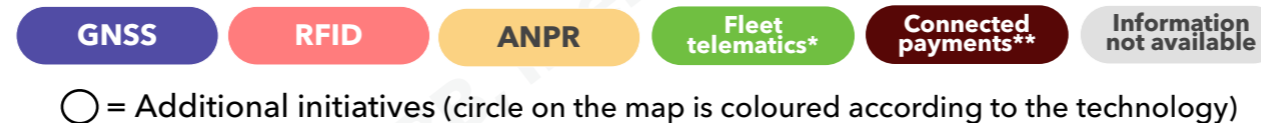
Electronic tolling scheme in place, 2020

● All vehicle tolling



# The current leading tolling technology is RFID with initiatives of other technologies in some cities

## North American technology landscape, 2020



- **Electronic Tolling Collection (ETC)** can be supported by several technologies including DSRC, GNSS, RFID, infrared, ANPR and telematics.
- **RFID** is the **dominant electronic tolling technology** across the **US and Canada**
- However, **initiatives** using **ANPR, DSRC, fleet telematics and connected payments** exist in some cities.

# US is currently promoting interoperability among electronic tolling technologies

## Interoperability initiatives in North America



The US is currently applying lessons learned from the ATI Hub program to create several regional hubs to increase interoperability

- **Interoperability** initiatives exist to adopt **electronic tolling technologies** able to read multiple **transponders**

# RUC projects are becoming a reality in North America

## Summary of key changes in North America

### NEW IMPLEMENTATIONS

Oregon launches US' first Road User Charging pilot project, 'OReGO'

The Eastern Transportation Coalition, also known as the I-95 Corridor Coalition, launched its first passenger vehicle pilot to start exploring MBUFs

California launches the California Road User Charge program

Utah's RUC scheme for EVs is launched

Planned all-vehicle road usage charge to be launched in Wyoming

Canada removes tolls from the Port Mann bridge

US launches first mileage-based road user charging scheme for HGVs

2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025

The United States passes the Moving Ahead for Progress in the 21st Century Act (MAP-21) to govern surface transportation.





Fixing America's Surface Transportation (FAST) Act reauthorised for one year

President-elect Biden promises \$50 billion for highway bridges and road repairs in the first year of his administration

California to test how road charges can work with 4 technologies: usage-based insurance, ride-sharing, EV charging stations/pay-at-the-pump systems, and autonomous vehicles

### REGULATORY CHANGES

# Traditional solutions will face stiff competition from new technologies, as demand for value-added services grows

Technology	DSRC	GNSS/Hybrid	ANPR/ALPR	RFID	Infrared	Fleet telematics	Smartphone	Embedded
Devices								
Implementation	<ul style="list-style-type: none"> <li>E-Toll (China)</li> <li>Libert-T (France)</li> <li>Telepass (Italy)</li> <li>ETC 2.0 (Japan)</li> </ul>	<ul style="list-style-type: none"> <li>Toll Collect (Germany)</li> <li>ERP (Singapore 2020)</li> <li>Platon (Russia)</li> <li>Viapass (Belgium)</li> </ul>	<ul style="list-style-type: none"> <li>HGV charge (New Zealand)</li> <li>London congestion charge</li> <li>Colorado turnpike (USA)</li> </ul>	<ul style="list-style-type: none"> <li>FASTag (India)</li> <li>E-Toll (Vietnam)</li> <li>E-ZPass (USA)</li> <li>HGS (Turkey)</li> </ul>	<ul style="list-style-type: none"> <li>E-Toll (Indonesia)</li> <li>Westerschelde Tunnel (Netherlands)</li> </ul>	<ul style="list-style-type: none"> <li>Hu-Go (Hungary)</li> <li>Bulgaria</li> </ul>	<ul style="list-style-type: none"> <li>AmberOne (Poland)</li> <li>Autuma (Spain)</li> </ul>	<ul style="list-style-type: none"> <li>Audi's Integrated Toll Module in the US</li> </ul>
Device cost	€5 - 15	€70 - 150	n.a.	€0.20 - 20	€10 - 20	€15-50	€0	n.a.
Opportunity for VAS	Medium	High	Low	Medium	Low/Medium	High	High	High
Read rate	>99%	Device dependent	90-98%	>99%	>99%	>99%	90-98%	n.a.
TRADITIONAL TECHNOLOGIES						EMERGING TECHNOLOGIES		

# New forces are impacting the growth and penetration of ETC

## POLITICAL TRENDS

- P1** Infrastructure funding crises
- P2** Environmental movement
- P3** Use of road charging as congestion management tool
- P4** Introduction of free flow tolling
- P5** Growing acceptance of public-private funding models
- P6** Cross-border transport movement
- P7** Nationalisation trends
- P8** Merger between infrastructure and environmental goals

## TECHNOLOGICAL TRENDS

- T1** Advancements in mobile technologies
- T2** Growth of cashless payments
- T3** Growth of connected payments
- T4** Shift towards centralised map matching
- T5** Introduction of V2X
- T6** Introduction of autonomous vehicles

## MARKET TRENDS

- M1** Integration into mobility services
- M2** Entry of new mass market providers
- M3** Shift in stakeholder business models

# The number of players competing to deliver tolling payments and services continues to increase

10 groups are now positioned as toll service providers



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# Country analysis example



FREE SAMPLE COUNTRY PROFILE



## Asia Pacific

Australia



New Zealand



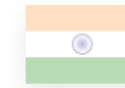
China



Philippines



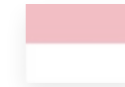
India



Singapore



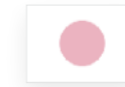
Indonesia



South Korea



Japan



Taiwan



Malaysia



Thailand



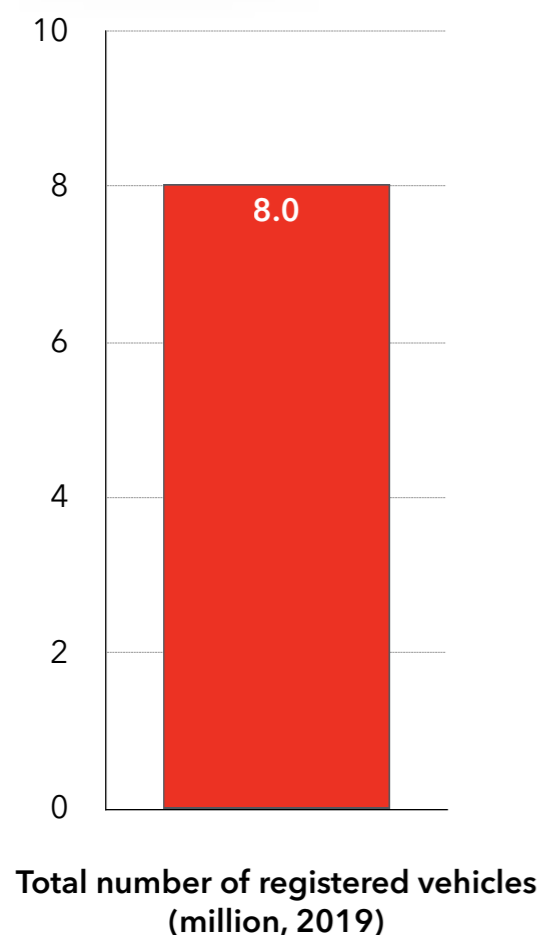


# Taiwan's successful ETC scheme has reached almost 90% penetration

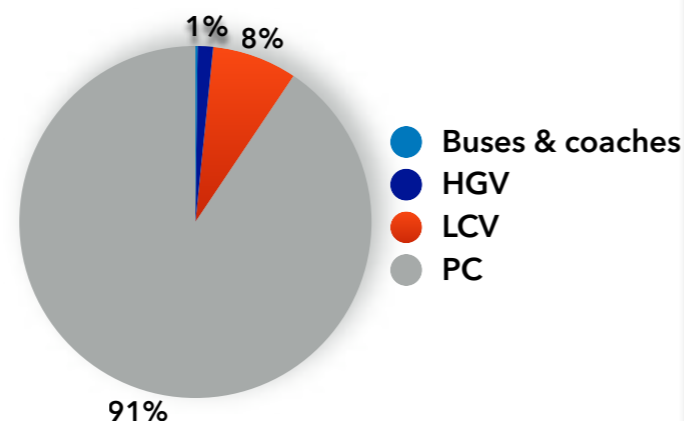


Taiwan

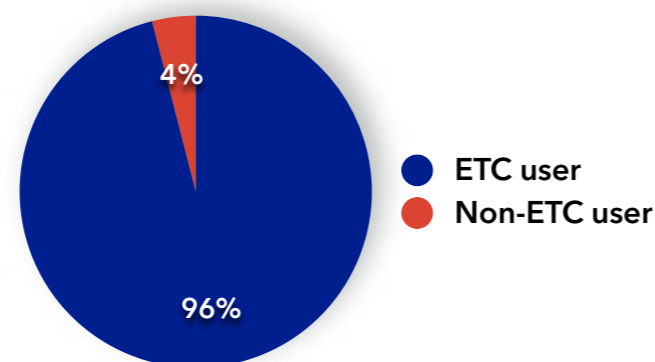
- **Population:** 23.8 million
- **Total road network:** 43,133 km
- **Total toll road network:** 926 km
- **Current tolling schemes:** RFID Tag one concessionaire in charge of building and operating all electronic toll roads
- **Future schemes:** Continue with the current free flow tolling until concession contract end in 2024



Domestic vehicle split



ETC penetration rate



## Qualitative analysis

- In 2013, Taiwan became the first country to **switch from manual tolling to all ETC, multi-lane free flow tolling** on all freeways
  - **Taiwan Area National Freeway Bureau (TANFB)** is responsible for motorway maintenance, expansion, traffic management, tolls travel services
  - **Far Eastern Electronic Toll Collection Co. (FETC)** is responsible ETC system, including front-end and back-end as well as business model, from planning, building, and operation
- The distance-based ETC system is a milestone in Taiwan's transportation industry and is setting a model for neighbouring countries to learn from
- Since the introduction of this ETC system, an estimated **\$67 millions** is saved annually in fuel savings; shortened travel time; less congestion resulting in reduced CO2 emission level; cost of printing toll ticket
- Since its inception in 2005, Taiwan ETC proved efficiency resulting major achievements, as of 2019:
  - ETC Customer with RFID Tag 6.7 million ETC daily Transactions
  - Daily average: 16 million eTag Usage Rate 94%
  - Successful Tolling Rate 99.98%
- The **concession contract lasts for 20 years** and is **expected to expire by 2024** and the tolling operating will be transferred back to the TANFB
- eTag, the RFID sticker, was launched in 2012 and still in use today
  - **eTag users have a 10% discount** on toll charges
  - **Non-eTag users** can pay by **plate number recognition** without discounts
- eTag has a **wide application** in **daily payments, parking, fuelling, and smart city management**



# Far Eastern Group is the only concessionnaire appointed to build and operate ETC roads

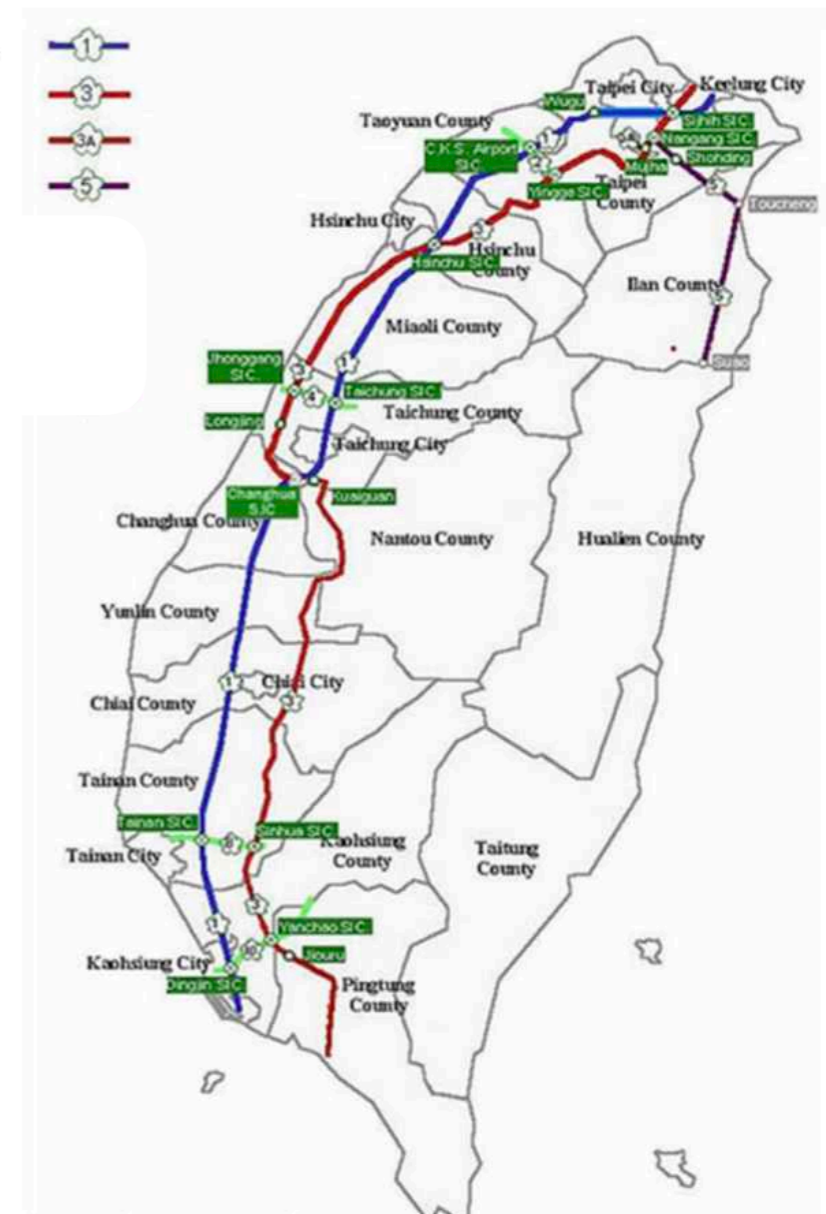
## Concession comparison

Concession	Network length (km)	No. of tolling transactions (m)	No. of ETC tags	ETC payment penetration
Far East ETC	1.050	76 million	7 million	93%

- Freeway Bureau has adopted a public-private-partnership (PPP) to design and operate the ETC system through granting build-operate-transfer (BOT) concession right of 20 years
  - In 2004 Far Eastern Electronic Toll Collection, owned by the Far Eastern Group, **was awarded the rights to build and operate the ETC systems until 2024**
  - In 2006, a flat-rate pay-per-use DSRC system was introduced
  - In 2012/2014, the tolling system migrated to RFID technology
  - By the end of the concession the motorway is expected to return the operation to the **Freeway Bureau of Taiwan**
  - The concessionnaire **collects tolls on behalf of the Freeway Bureau** and gets a **commission fee based** on the contract terms
- All toll roads are free flow ETC roads** include National Freeway 1, 3, 3A and 5

## Map of the Taiwan toll road network

National Freeway

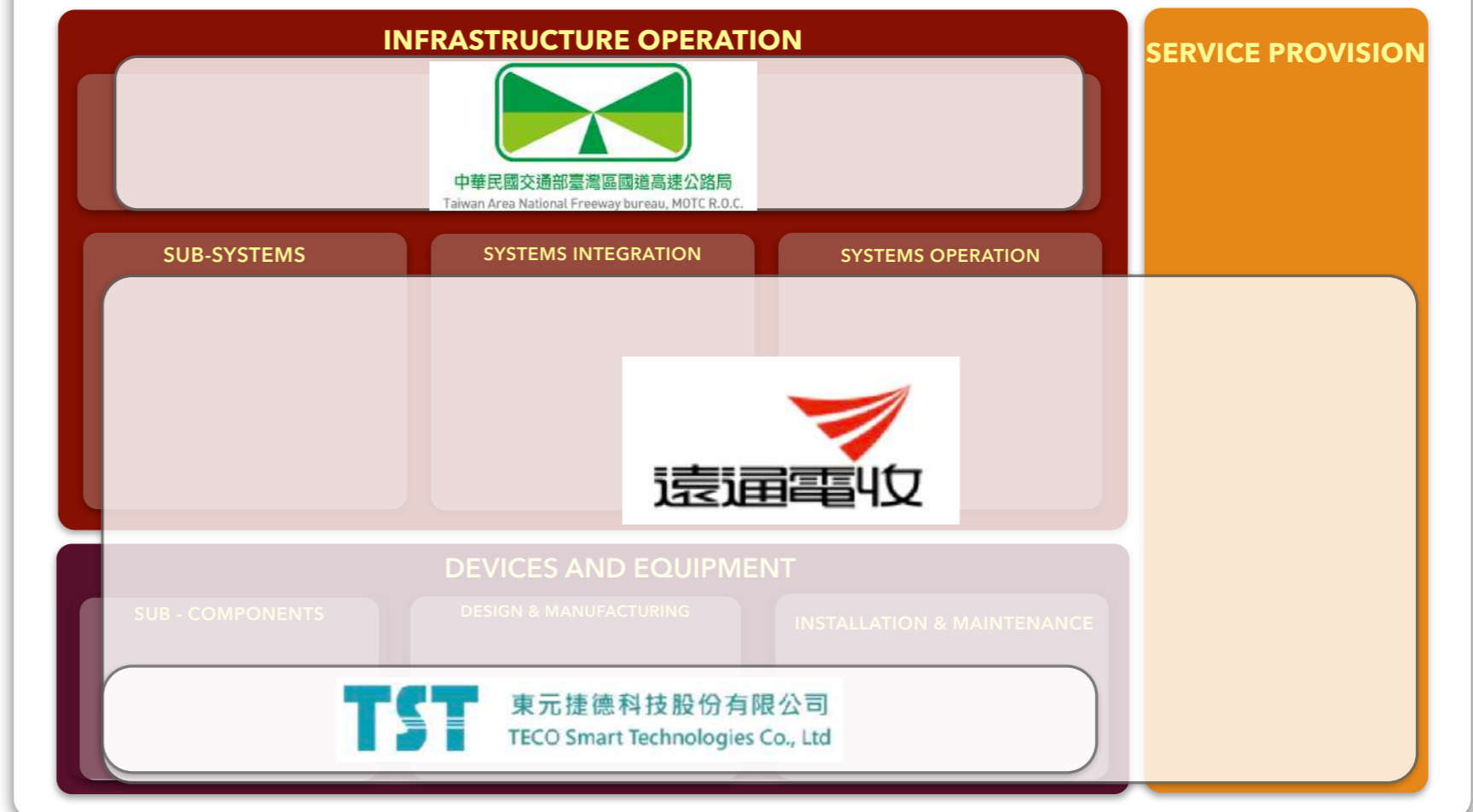


# TECO Smart Technologies is in charge of the design & manufacturing of the eTag device



- **Launch date:** 2012
- **Total tolled network:** 926 km
- **Device:** RFID tag + video tolling
- **Scope:** All vehicles, all toll roads
- **No. of vehicles equipped:** 7.7 million
- **Total tolls collected (2020):** € 7.2 billion

## Value chain structure



- The ETC system also includes an **ANPR solution** to recognise non-eTag users with plate numbers by the cameras on the gantries
- Drivers can register for service of **automatic toll deduction by linking bank cards** or pay later
- **eTag card is a small sized card** for users to top-up their accounts offline at convenience stores, fuel stations, or service points of Far Eastern ETC
- By showing the eTag card, users can get discounts from a wide range of service providers such as restaurants, hotels, and vehicle services

# FETC offers value-added services via its app in partnership with several service providers

## FETC Application



遠通電收ETC

- **App name:** Far Eastern ETC
- **Launch date:** April 2014
- **No. of installation:** 1 million+ (Android)
- **Main functions:** Account top-up, payment history, parking location, access to VAS, traffic information

## Key Partners & Value Added Services



Taiwan Designated Driver

### • Designated driver service:

- The service includes calling a designated driver to drive for the customer, often to avoid drunk driving

eTag GO 停車懶人包

### • Vehicle services:

- Services include **car repair, maintenance, diagnostics, windshield replacement, roadside assistance**, etc.
- eTag users are offered approximately **10% off** selected services and **free vehicle diagnostics service**



Bo's restaurant



### • Discounts at local commerce and fast food companies:

- Local businesses are increasingly joining to provide eTag users with discounts

## Services

### • ELECTRONIC TOLLING COLLECTION

- eTag users always get **10% off** of the standard toll fee
- The toll fee is automatically deducted and drivers are notified via a **SMS or the ETC app**
- Drivers can check **payment history** on the app

### • SMART TRAFFIC

- The public authority **syncs traffic information with Far Eastern ETC** so that they are able to **notify drivers with important traffic updates** via SMS or the ETC app including **traffic accidents, congestion, extreme weather, construction**, etc.

### • SMART PAYMENT

- With eTag on the vehicle, payments can be completed automatically including **payment for fuel and at drive-through restaurants**

### • SMART PARKING

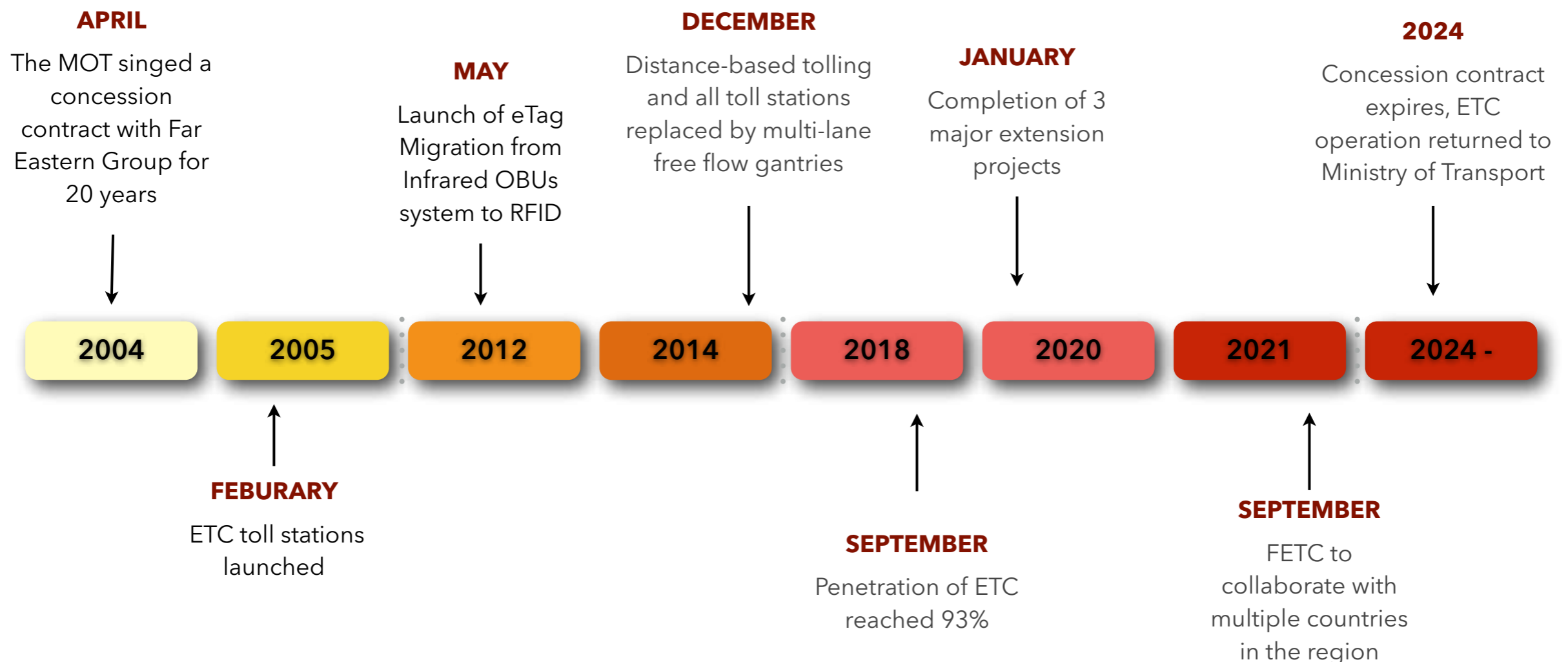
- eTag can be **recognised at the entry of the parking lots** and parking **fees will be automatically deducted**
- The **parking location is recorded** and can be checked on the app or be sent to the driver via SMS
- In October 2019, the eTag system parking solution was enabled for roadside parking in Taipei

### • VALUE ADDED SERVICES

- Value-added services are accessible on the app including vehicle accessory **e-shop, roadside assistance, designated driver service**, etc.

# The Taiwanese ETC system is fully Multi-Lane Free Flow since 2014

## Taiwan tolling timeline

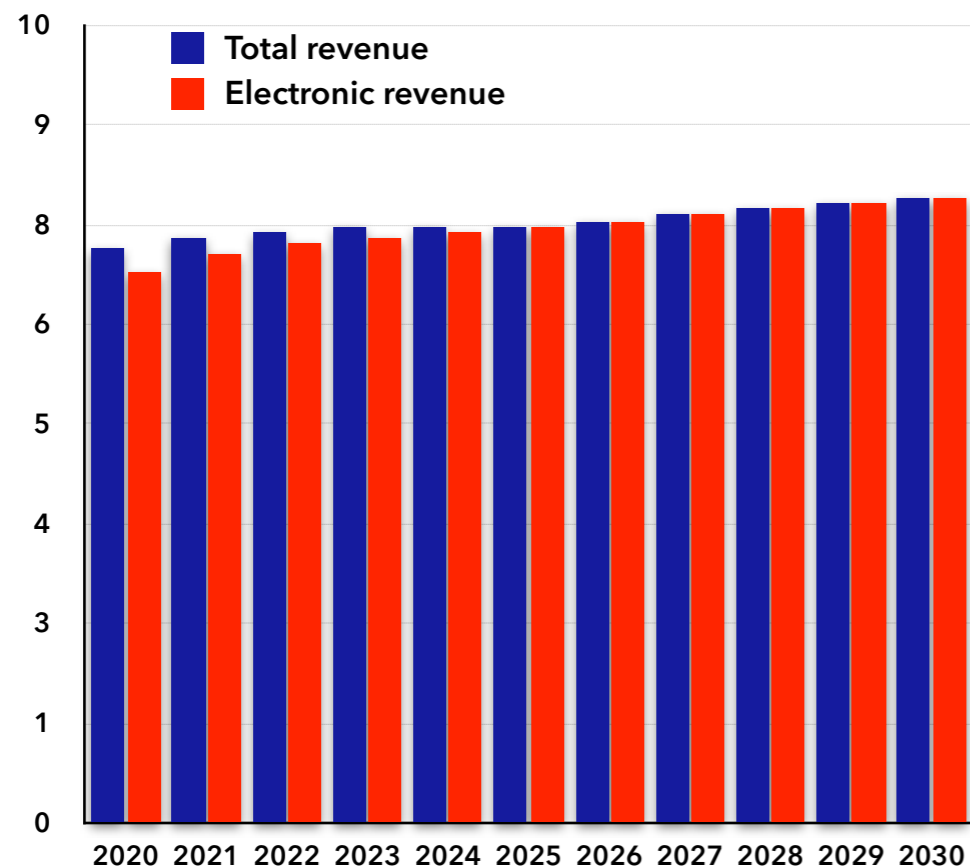




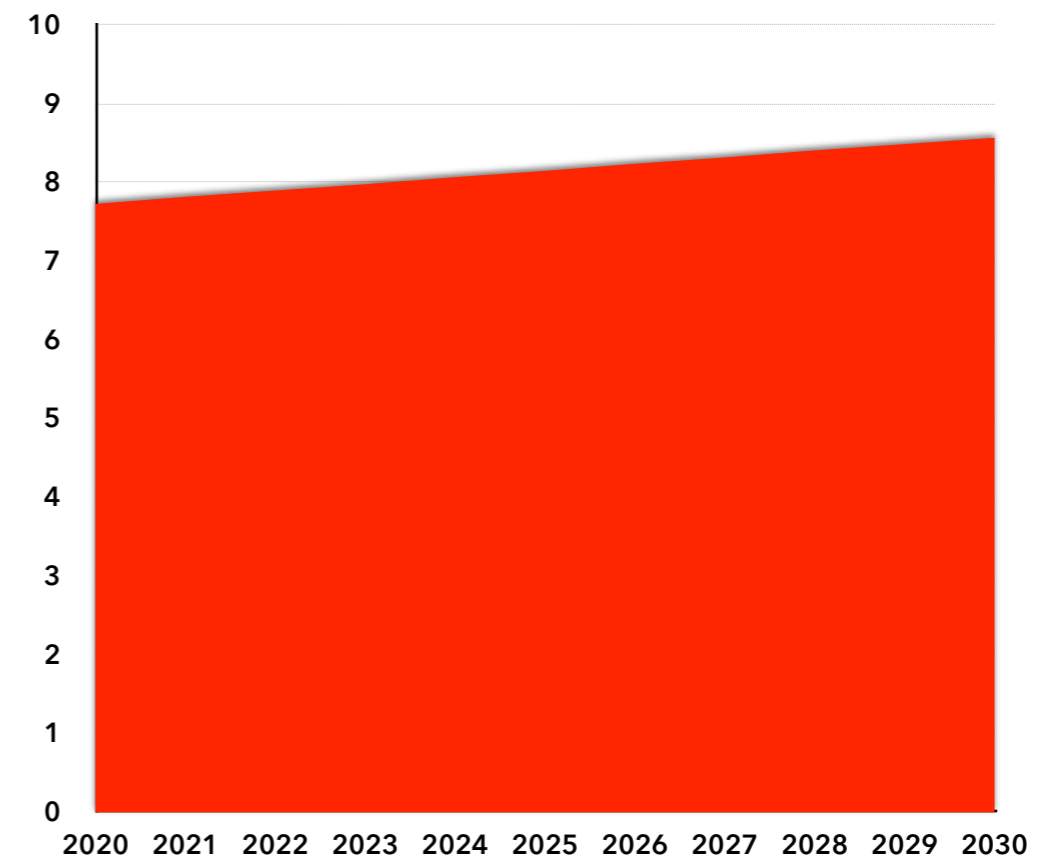
# Tolls will be 100 % electronic from 2025 on

## Total volumes and revenues in Taiwan

Total tolling revenue (€ million)



Number of registered OBUs (million)



- An increasing growth in tolling revenues is driven by countrywide multi-lane free flow tolling schemes
- The use of ETC is supposed to increase further in Taiwan and we expect a 100 % penetration will be reached until 2025

# Taiwan's success in implementing ETC and smart city technology is a model for the world

## Taiwan ETC & a smart city solution

- Taiwan is one of the few countries in the world that **did not implement a lockdown** during the COVID-19 pandemic; on the contrary, inland tourism rose resulting in a rise in toll road usage
- Taiwan's **success in implementing free flow ETC** was praised has become a model of success:
  - Nominated for the R&D 100 Awards
  - Received a US IBTTA (International Bridge, Tunnel and Turnpike Association) Toll Excellence Award
  - ITS (Intelligent Transport System) World Congress Industry Award.
- The eTag solution is now going beyond ETC and increasingly expanding into **smart city eTag payment**
  - There is wide application in parking, fuelling, and in daily purchases
- Taiwan is extending its highway network; 3 projects were completed in 2020, totalling approximately **€4 billion**:
  - Suhua Expressway Improvement Project on Highway No. 9 aiming to enhance tourism in the region
  - Extension the width of the South Link Highway (part of Highway No. 9)
  - The Sibin Expressway (Highway No. 61), also known as the "freeway for the poor," was completed after 20 years of construction

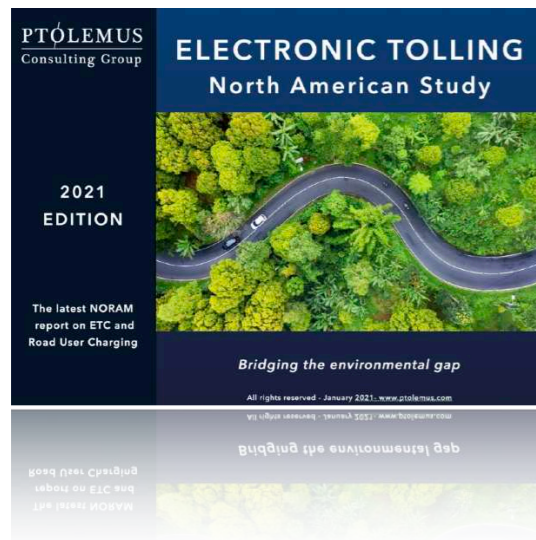


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# Report pricing



# The study comes with a single, worldwide company licence



**The global reference report on ETC and road user charging**

	<b>Full Study</b> (incl. market forecast)		<b>Market forecast</b> (Only)
	<b>Buy direct</b> (Invoice)	<b>Buy online</b> (Visa or MasterCard)	
<b>Contents</b>	<ul style="list-style-type: none"> <li>• <b>370-page study</b> with <b>2 country and 14 US state profiles</b>, including qualitative, competitive and value chain analysis</li> <li>• Service provider best practices</li> <li>• Interoperability models analysis</li> <li>• Smartphone-based tolling model analysis</li> <li>• In-depth regional assessment</li> </ul>		<ul style="list-style-type: none"> <li>• Excel file with outputs and charts</li> <li>• Estimates of the subscription volumes by technology and vehicle type</li> <li>• Devices sold, total revenues collected and ETC-only revenues</li> </ul>
<b>Company-wide licence</b>	<b>€ 2,995</b> Approx. \$3,050	<b>€ 2,995</b> Approx. \$3,050	<b>€ 500</b> Approx. \$510
	<b>E-mail us to request an invoice</b>	<b>Click <a href="#">here</a> to purchase online</b>	

For more information and to order the study or enquire about our new subscription model, email [contact@ptolemus.com](mailto:contact@ptolemus.com)

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