

ELECTRONIC TOLLING

European Study

**FREE
ABSTRACT**

The reference
report on European ETC
and 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



Market research services



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

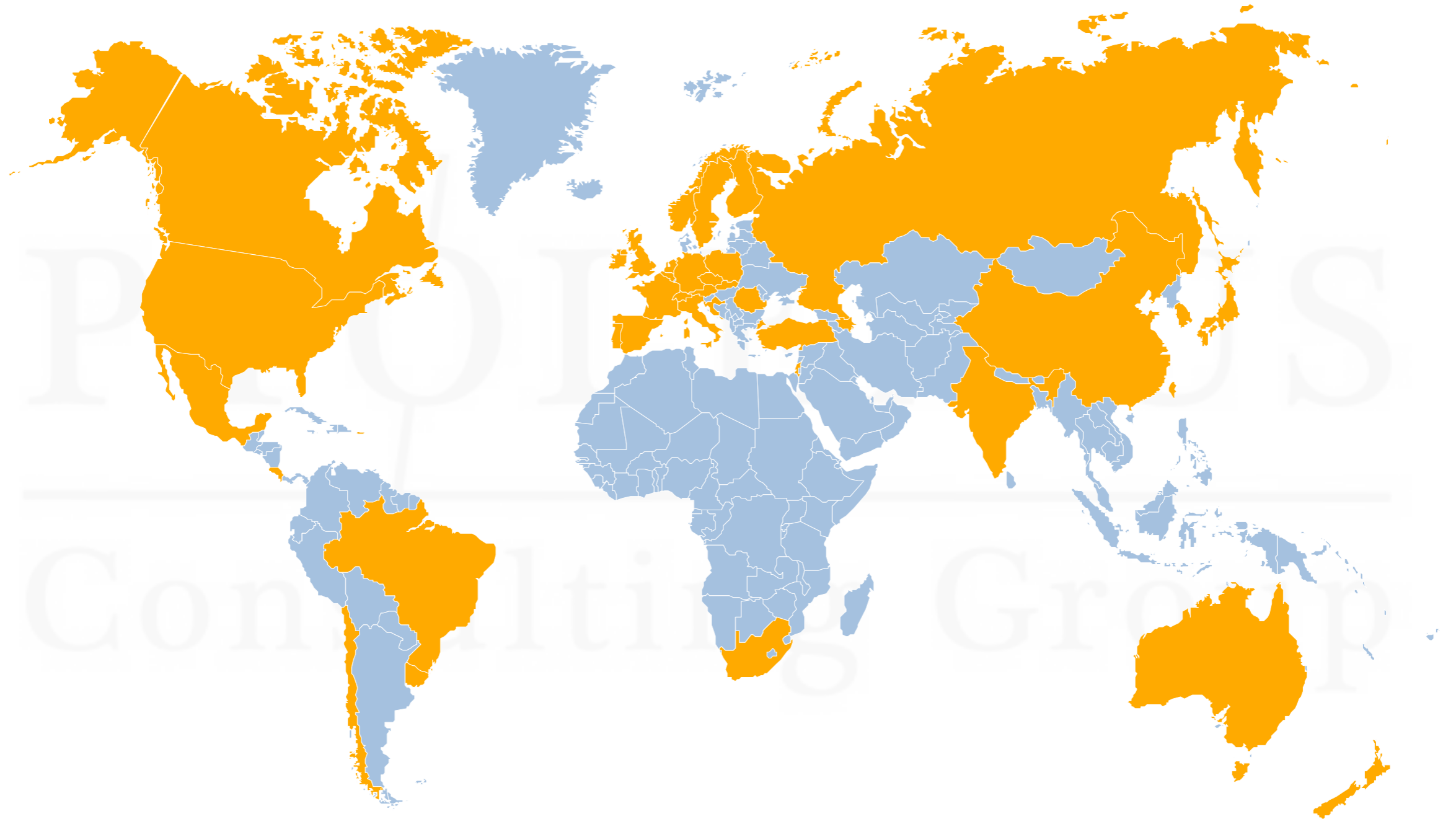


Banks & private equity investors



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

 Clients



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

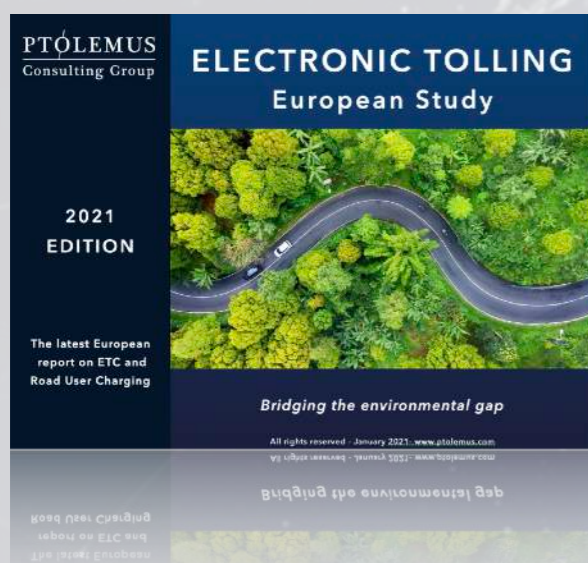
- **Strategy definition**
 - Road policy strategy assistance
 - Market entry assistance
 - Data strategy and analysis
 - Mobile tolling strategy development
 - Multimodal mobility design and planning
 - Future vision of vehicle payments
 - Strategy orientation workshops
- **Innovation strategy**
 - Vertical 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 European ETC report



The most comprehensive report on European 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 Europe
- A **560-page analysis of the European electronic tolling landscape** based on:
 - 9 years of constant market surveillance
 - 32 interviews with key stakeholders
 - 6 months of desk research by a team of 7 consultants
 - 35 strategy consulting assignments in the ETC domain
- An **in-depth review of the 32 largest countries that operate tolling in Europe** 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
- **9 EETS service providers profiled, analysing:**
 - Strategic position
 - Service breakdown
- An **in-depth assessment of Europe 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**
 - European scope: **32 countries investigated in detail**
 - **Projections** of the toll and electronic toll market in Europe: 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, Moveo, 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 Europe 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 Europe ready to implement road usage charging (RUC)?

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

Will new technologies help drivers accept tolling?

How does data help providers expand their service offerings?

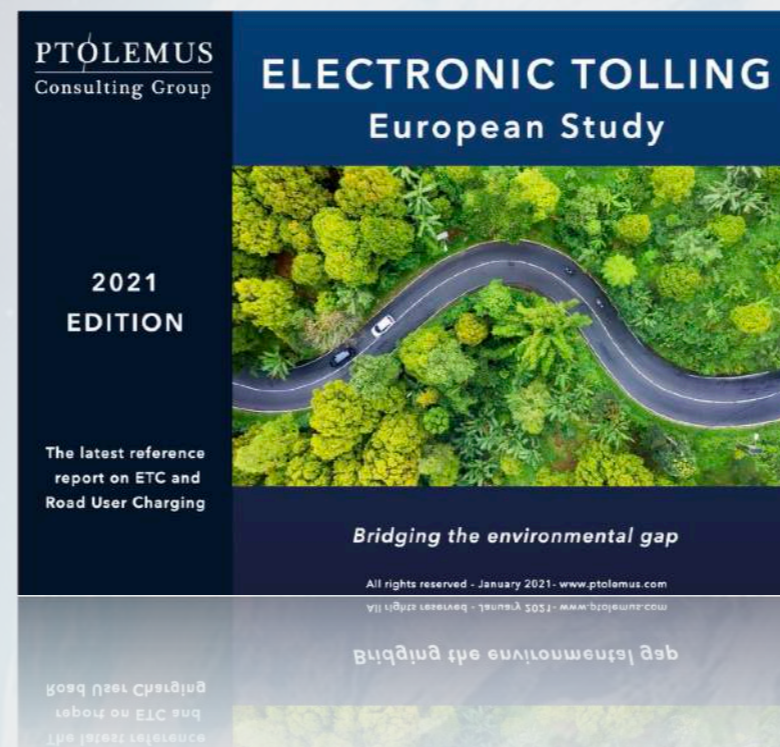
Will multi-lane free flow tolling become the new normal?

Which OEMs are implementing connected toll payment?

Will toll devices disappear?

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

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



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

- Tolling types and their effects on emissions
- Europe and the green movement
- 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
 - Austria
 - Belarus
 - Belgium
 - Bosnia and Herzegovina
 - Bulgaria
 - Croatia
 - Czech Republic
 - Denmark
 - Estonia
 - Finland
 - France
 - Germany

- Greece
- Hungary
- Ireland
- Italy
- Latvia
- Lithuania
- Norway
- Poland
- Portugal
- Russia
- Serbia
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- The Netherlands
- The UK
- Turkey
- Ukraine

7. European outlook: the future of ETC and RUC

Across the report, we deliver qualitative and quantitative insight into 32 countries...

Report coverage

 Countries covered by this report



...and contains profiles of 32 key European countries

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

The report mentions more than 130 companies (1/4)

Company	Country	Type	Company	Country	Type	Company	Country	Type
A-to-Be	Portugal	Tolling, urban mobility, RUC, traffic operations	ASETA / SEOPAN	Spain	Association	BEMOBILE	Belgium	Mobility service provider
A4 Mobility	Italy	Systems integrator	ASFINAG	Austria	Toll charger	Bip&Go	France	Service provider
Abertis	Spain	Toll road operator	ASPI	Italy	Road concessionaire	Bips&Drive	Spain	Toll service provider
AISCAT	Italy	Association	Atlantia	Italy	Concessionaire	BlaBlaCar	France	Mobility service provider
Allianz	Germany	Insurer	Audi	Germany	Automotive OEM	BMW	Germany	Automotive OEM
AmberOne	Poland	Toll operator	AutoPass	Norway	Service provider	Bosch	Germany	Device and equipment supplier
APCAP	Portugal	Association	Autostrada Pedemontans Lombardia	Italy	Toll operator	Brisa	Portugal	Road operator
APRR	France	Road operator	Autostrade per l'Italia	Italy	Toll operator	BroBizz	Denmark	Toll service provider
Aral	Germany	Oil company	Autostrade Tech	Italy	Device and equipment supplier	Chevin	UK	Fleet management service provider
AS24	France	Fuel provider	Autostrady	Poland	Toll operator	Cintra	Spain	Concessionaire
ascendi	Portugal	Road operator	Avtodor	Russia	Toll charger	Confidex	Global	Mobility service provider
			Axxès	France	Toll service provider	Continental	Germany	Device and equipment supplier
			Belorusneft	Belarus	Petroleum company	Cyclope.ai	France	Technology provider
			BelToll	Belarus	Toll operator			

The report mentions more than 130 companies (2/4)

Company	Country	Type	Company	Country	Type	Company	Country	Type
czechtoll	Czech Rep.	Toll operator	eFlow	Ireland	Service provider	Grundig	Germany	Device and equipment supplier
Daimler AG	Germany	Automotive OEM	Egis	Global	Toll operator/ Service provider	Hellastron	Greece	Association
DARS	Slovenia	Toll service provider	Eiffage	France	Transportation company	Here	Netherlands	Software editor
Dart Charge	UK	Payment provider	emovis	France	Systems integrator and operator	HGS	Turkey	Service provider
DBA Group	Italy	Integrator	ENI	Italy	Service provider	Hochtief	Germany	Construction company
Department for Transport, UK	UK	Toll charger	European Commission	Europe	Government institution	Hu-Go	Hungary	Service provider
DKV	Germany	Toll service provider	Eurotoll	France	EETS provider	IBM	Belgium	System integrator
Dots	Latvia	Technology provider	Eurowag	Czech Rep.	EETS provider and fuel card issuer	IBTTA	Global	Toll association
DriveNow	Germany	Mobility service provider	FAI Service	Italy	Fleet management service provider	iDVROOM	France	Mobility service provider (part of Klaxit)
E100 fuel card	Poland	Fuel card provider	FCA	Italy	Automotive OEM	Indra	Spain	System integrator
EasyPark	France	Parking provider	GDDKiA	Poland	Infrastructure operator	Intertoll	Hungary	Toll and motorway infrastructure operator
Easytrip	France	Service Provider	General Directorate of Highways (KDM)	Turkey	Toll charger	itronics	France	Electronic card manufacturer
Edenred	France	Service provider	GMV	Spain	Technology company	ITS Teknik	Denmark	Technology company
EFKON AG	Austria	Device and equipment supplier				Jenoptik	Germany	Device and equipment supplier
						JP Autocested	Bosnia and Herzegovina	Concessionaire

The report mentions more than 130 companies (3/4)

Company	Country	Type	Company	Country	Type	Company	Country	Type
Kapsch TrafficCom AG	Global	Device and equipment supplier, system integrator and concessionaire	ParkNow	France	Parking solutions	Schneider Electric	Global	Integrator
Klaxit	France	Carpool service provider	Platon	Russia	Toll solutions provider and systems management company	Shell	Global	Energy company
Liber-T	Belgium	Service provider	PSA Group	France	Automotive OEM	SICE	Spain	System integrator
LogPay	Germany	Toll service provider	Q-Free	Norway	Device and equipment supplier	Siemens	Germany	Device and equipment supplier
LOTTOMATICA	Italy	Service provider	Renault	France	Automotive OEM	Skycash	Poland	Payment service provider
Mercedes-Benz	Germany	Automotive OEM	Ressa	Italy	Energy company	Skytoll	Slovakia	Toll charger
Microlise	UK	Fleet management service provider	Rosavtodor	Russia	Toll charger	STRABAG	Austria	Construction company
MSTS	Netherlands	EETS Service provider	RT-invest	Russia	Device and equipment supplier	Sund & Bælt Holding A/S	Danemark	Infrastructure operator
Norbit	Norway	Device and equipment supplier	Transport Systems	Russia	Construction company	Survision	France	Technology provider
Northgate Public Services	UK	Systems integrator	Sacyr	Spain	Road operator	T pass	Russia	Service provider
OMV	Germany	Fuel card provider	SANEF	France	Service provider	T-Systems International GmbH	Denmark	Integrator
ØRESUNDSBRO KONSORTIET	Denmark	Road operator	Satellic	Belgium	Ferry operator	Tanktaler	Germany	Mobile application provider
Pagatelia	Spain	Service provider	Scandlines	Denmark	automotive OEM	Tattile	Italy	Device and equipment supplier
			Scania	Sweden		Tecsidel	Spain	Systems provider and integrator

The report mentions more than 130 companies (4/4)

Company	Country	Type	Company	Country	Type
Telekom Slovenia	Slovenia	Telecomms company			
Telepass	Italy	EETS provider / toll operator	Vendeka	Turkey	Device and equipment supplier, system integrator
Telit	Global	Technology provider	Via Verde	Portugal	Service provider
Thales	France	Transportation and technology company	Via-T	Spain	Service provider
Toll2Go	Austria	Service provider	Vialitoral	Portugal	Concessionaire
Toll4Europe	Europe	EETS provider	Vialtis	France	Fleet management service provider
Tolltickets	Germany	EETS provider	Viapass	Belgium	Toll operator
TomTom	Netherlands	Telematics service provider	viaTOLL	Poland	Service provider
Total	Global	Energy company	Vinci	France	Road operator
Trafineo GmbH & Co. KG	Germany	Toll service provider	Vitronic	Germany	Device and equipment supplier
Transport for London	UK	Transportation authority	Volkswagen	Germany	Automotive OEM
UnipolSai Assicurazioni S.p.A.	Italy	Insurance company	Volvo	Sweden	Automotive OEM
UTA	Germany	Fuel card provider	WirelessCar	Sweden	Telematics service provider

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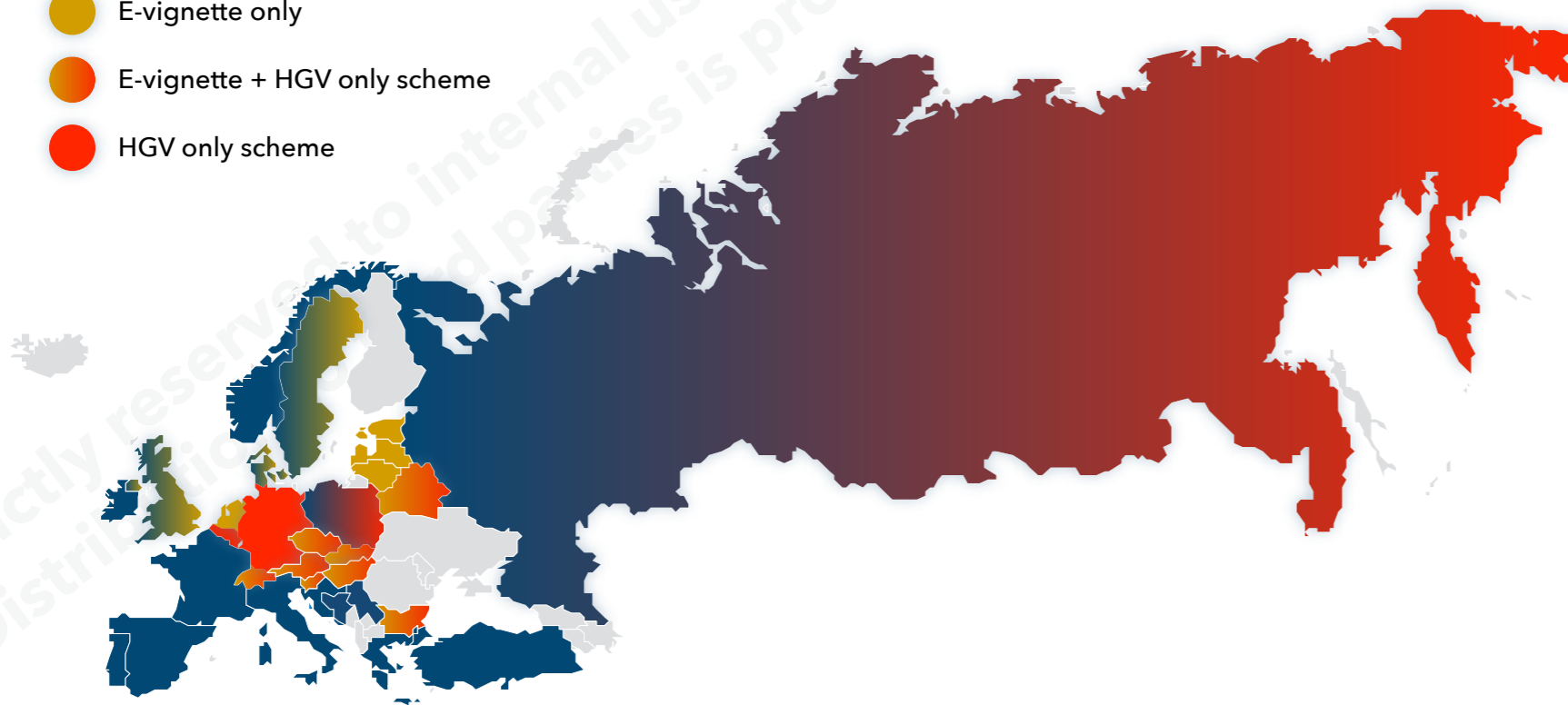
Trends impacting the ETC ecosystem



Electronic road tolls currently exist in most European countries

Electronic tolling schemes in place, 2020

- All vehicle tolling
- All vehicle tolling + e-vignette
- All vehicle tolling + HGV only scheme
- E-vignette only
- E-vignette + HGV only scheme
- HGV only scheme

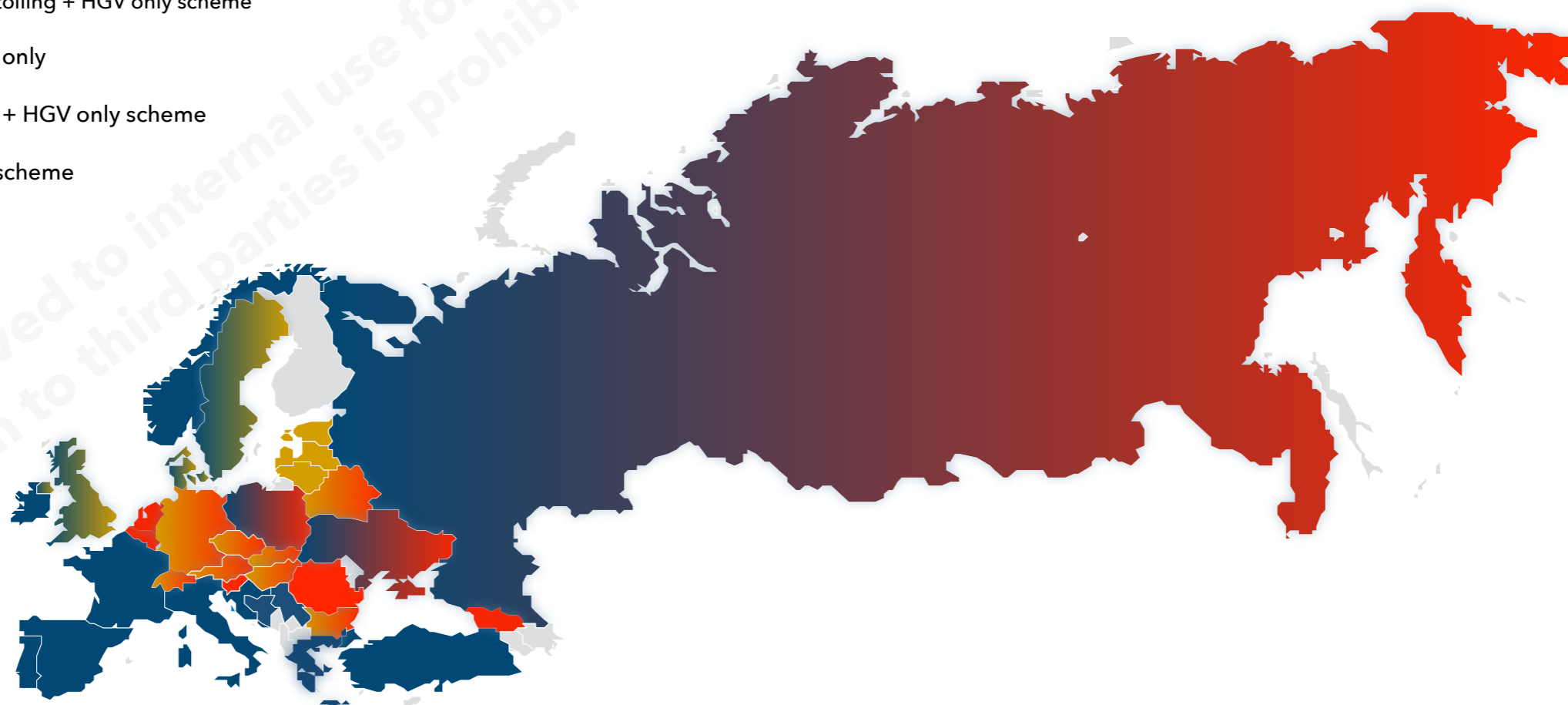


- **Countries** across Europe have **different electronic tolling schemes** for their electronic tolled roads.
- For the **total of electronic tolled roads**, some countries **apply electronic tolling** to:
 - All vehicle types. (Ex. France, Spain)
 - HGV only. (Ex. Germany)
 - All vehicle types on some toll roads and HGV only on other toll roads. (Ex. Poland)
- Some countries have also implemented the e-vignette. (Ex. Sweden, UK)

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

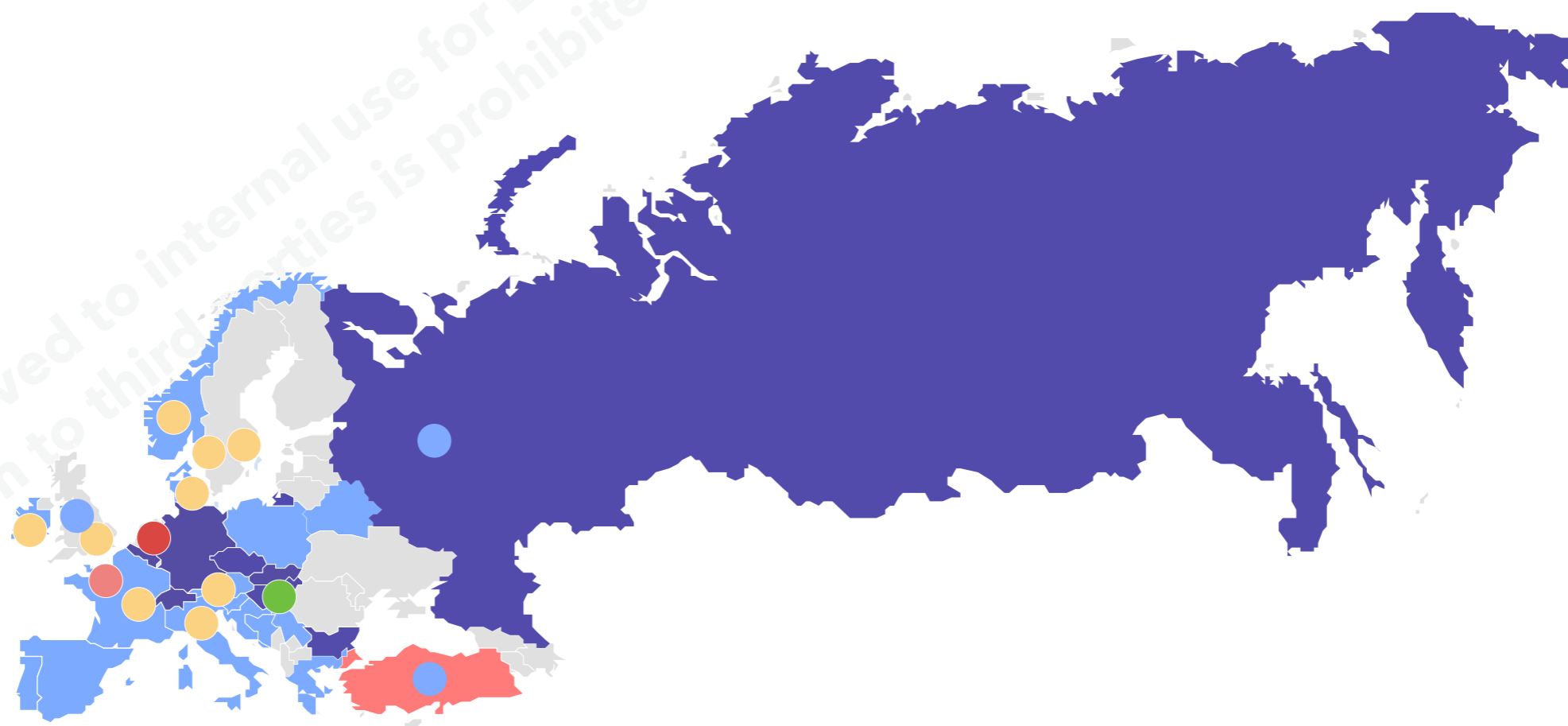
Electronic tolling schemes in place, 2025

- All vehicle tolling
- All vehicle tolling + e-vignette
- All vehicle tolling + HGV only scheme
- E-vignette only
- E-vignette + HGV only scheme
- HGV only scheme



Currently tolling technology is heterogenous and driven by national decision-making

European technology landscape, 2020



This fragmentation has resulted in interoperability initiatives, which have had varying levels of success

Interoperability initiatives in Europe

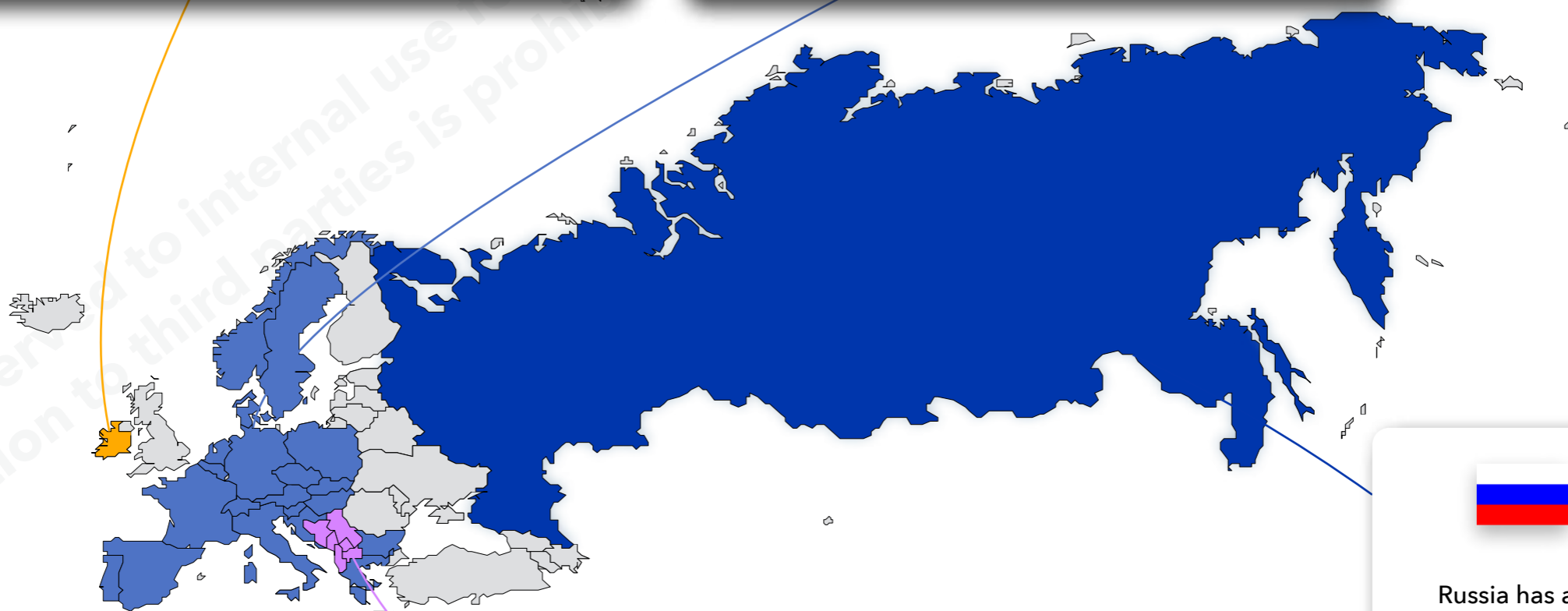


Ireland's central clearing house has become a model of public authority - led interoperability.

The structure supports 11 different toll roads and 14 service providers, processing over 50 million interoperable transactions per year



The European Electronic Toll Service (EETS) programme is the only truly international interoperability project. New legislation has allowed for the use of emerging technologies for interoperability.



The Balkans' interoperability program is the first step towards integrating the Western Balkans into EETS

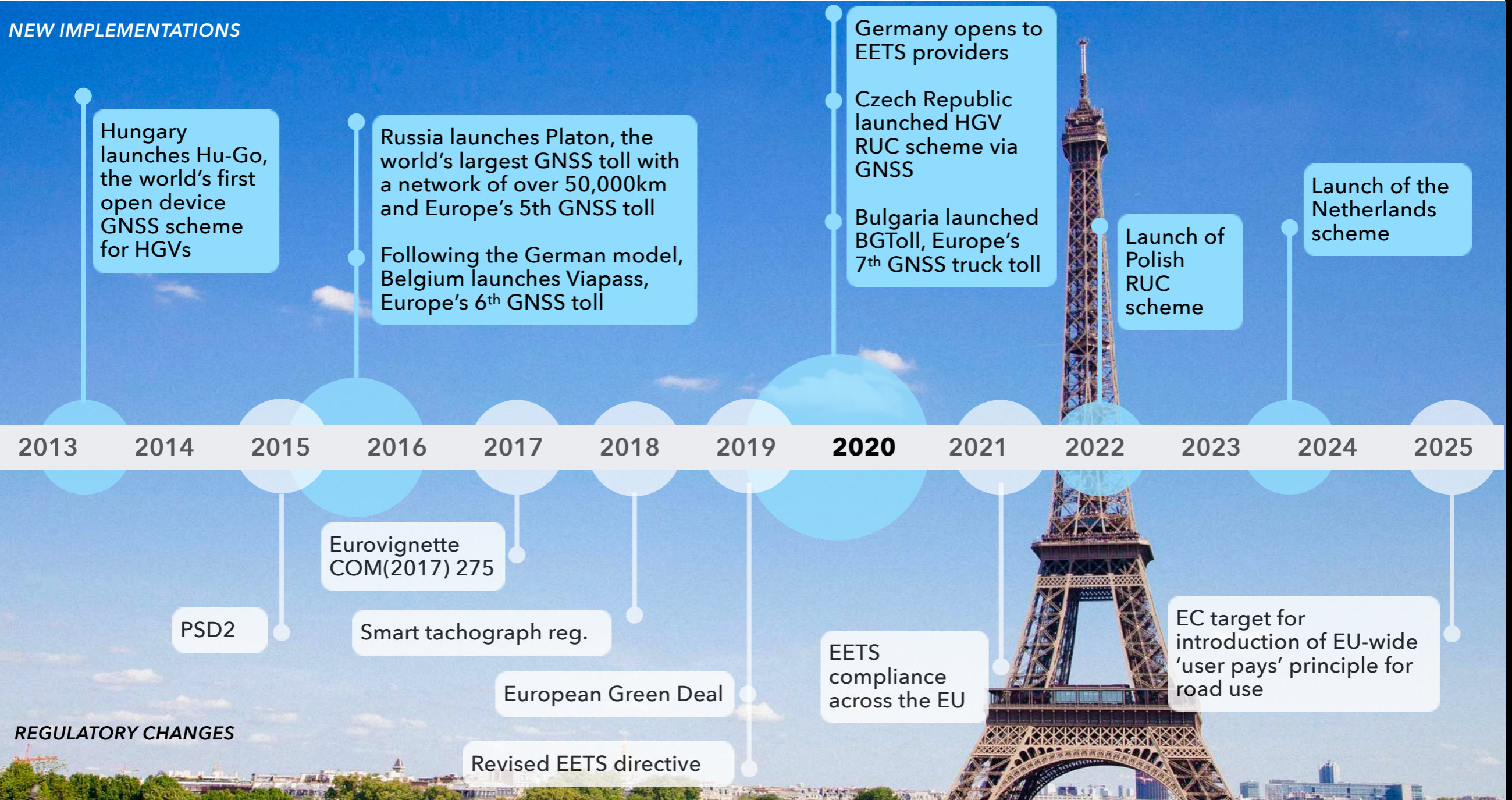


Russia has also developed a clearing house which allows toll operators to exchange charging and billing information



In Europe, new schemes are being driven by legislation

Summary of key changes in Member States and at EU level

NEW IMPLEMENTATIONS



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"> E-Toll (China) Libert-T (France) Telepass (Italy) ETC 2.0 (Japan) 	<ul style="list-style-type: none"> Toll Collect (Germany) ERP (Singapore 2020) Platon (Russia) Viapass (Belgium) 	<ul style="list-style-type: none"> HGV charge (New Zealand) London congestion charge Colorado turnpike (USA) 	<ul style="list-style-type: none"> FASTag (India) E-Toll (Vietnam) E-ZPass (USA) HGS (Turkey) 	<ul style="list-style-type: none"> E-Toll (Indonesia) Westerschelde Tunnel (Netherlands) 	<ul style="list-style-type: none"> Hu-Go (Hungary) Bulgaria 	<ul style="list-style-type: none"> AmberOne (Poland) Autuma (Spain) 	<ul style="list-style-type: none"> Audi's Integrated Toll Module in the US
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

<p>ROAD OPERATORS</p> 	<p>Road operators have long provided ETC solutions for the payment of tolls on their own roads</p>	<p>Fleet telematic service providers (TSPs) provide telematic solutions for fleet management services, such as tracking, geofencing, and compliance</p>	<p>FLEET TELEMATICS PROVIDERS</p> 
<p>TOLL SERVICE PROVIDERS</p> 	<p>Toll service providers tend to be aggregators, working with several concessionaires to provide interoperable solutions</p>	<p>OEMs are becoming the provider at the point of use but the toll payment itself is often completed through a partnership with a platform provider or toll service provider</p>	<p>AUTOMOTIVE OEMs</p> 
<p>FUEL CARD ISSUERS</p> 	<p>Fuel card issues (FCIs) offer toll payment to their fuel customers for low services fees as a value-added service</p>	<p>Navigation giants are exploring mobility payments across the ecosystem and could implement toll payment in their platform</p>	<p>NAVIGATION GIANTS</p> 
<p>ENERGY COMPANIES</p> 	<p>Energy companies are making moves into toll payment, particularly in Europe, with the development of toll specialist subsidiaries</p>	<p>Payment providers are already providing mobile payment solutions</p>	<p>PAYMENT PROVIDERS</p> 
<p>FLEET MANAGEMENT SERVICE PROVIDERS</p> 	<p>Fleet management service (FMS) providers offer an array of fleet management services, supported with or without telematics</p>	<p>Mobility service providers are beginning to incorporate toll payment in their wide mobility offerings, which might also include parking, car-sharing, and fuel</p>	<p>MOBILITY SERVICE PROVIDERS</p> 

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Country analysis example




FREE SAMPLE COUNTRY PROFILE




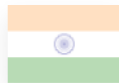
Asia Pacific


Australia 


New Zealand 


China 


Philippines 


India 

Singapore 

Indonesia 

South Korea 

Japan 

Taiwan 

Malaysia 

Thailand 



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

FREE SAMPLE COUNTRY PROFILE

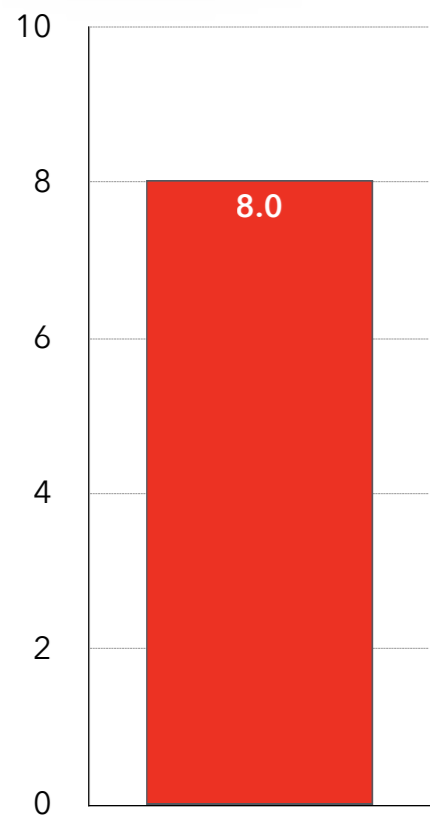


Taiwan

- **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

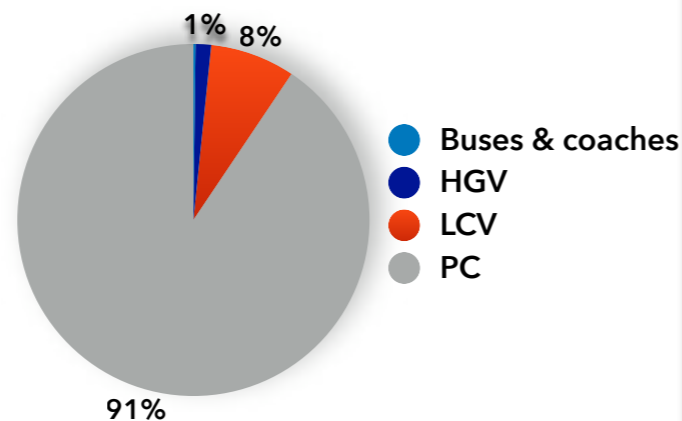
Qualitative analysis

- In 2013, Taiwan became to 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**

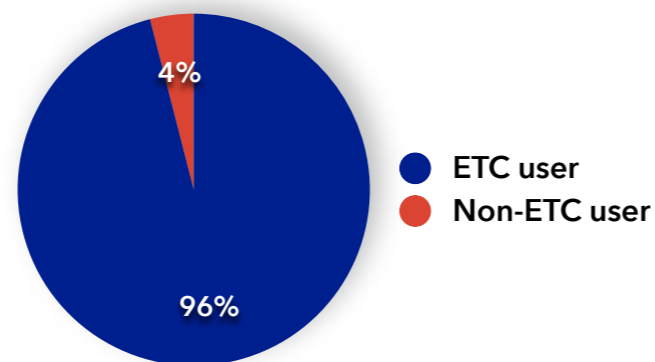


Total number of registered vehicles (million, 2019)

Domestic vehicle split



ETC penetration rate





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

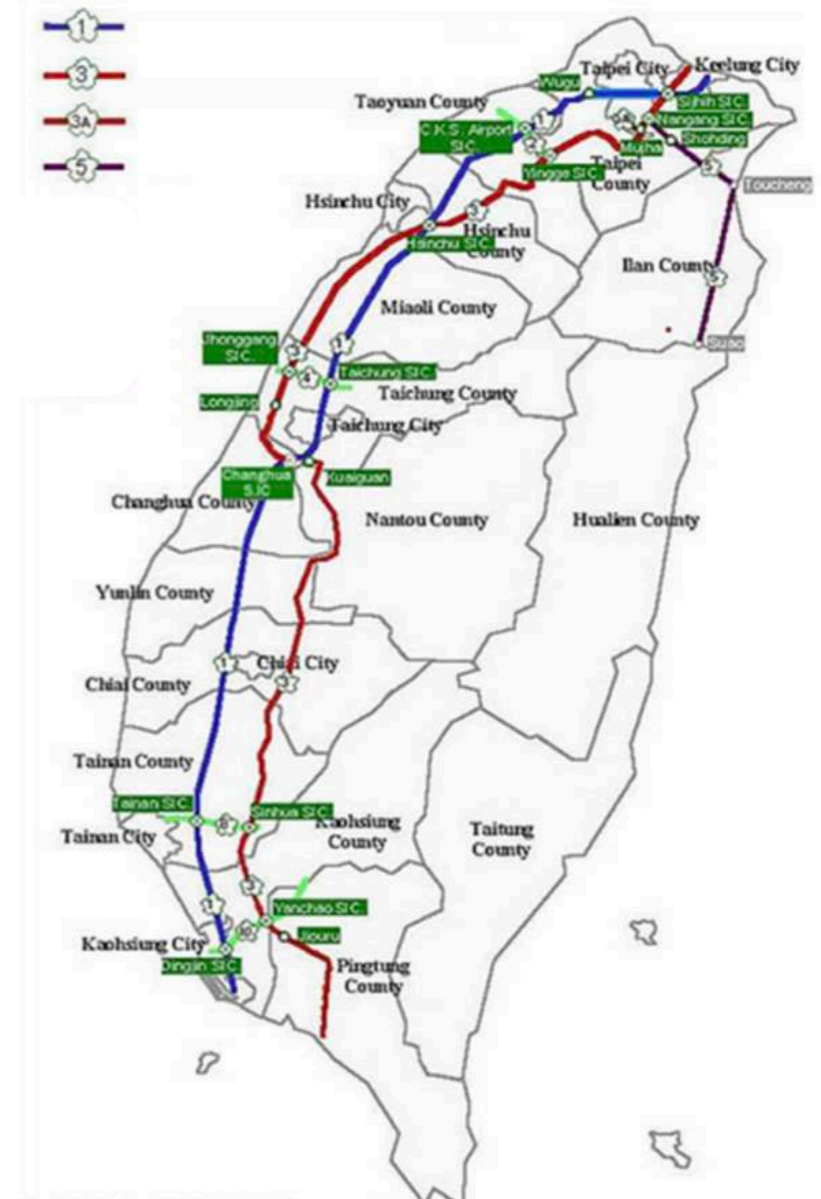
Concession comparison

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 concessionaire **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





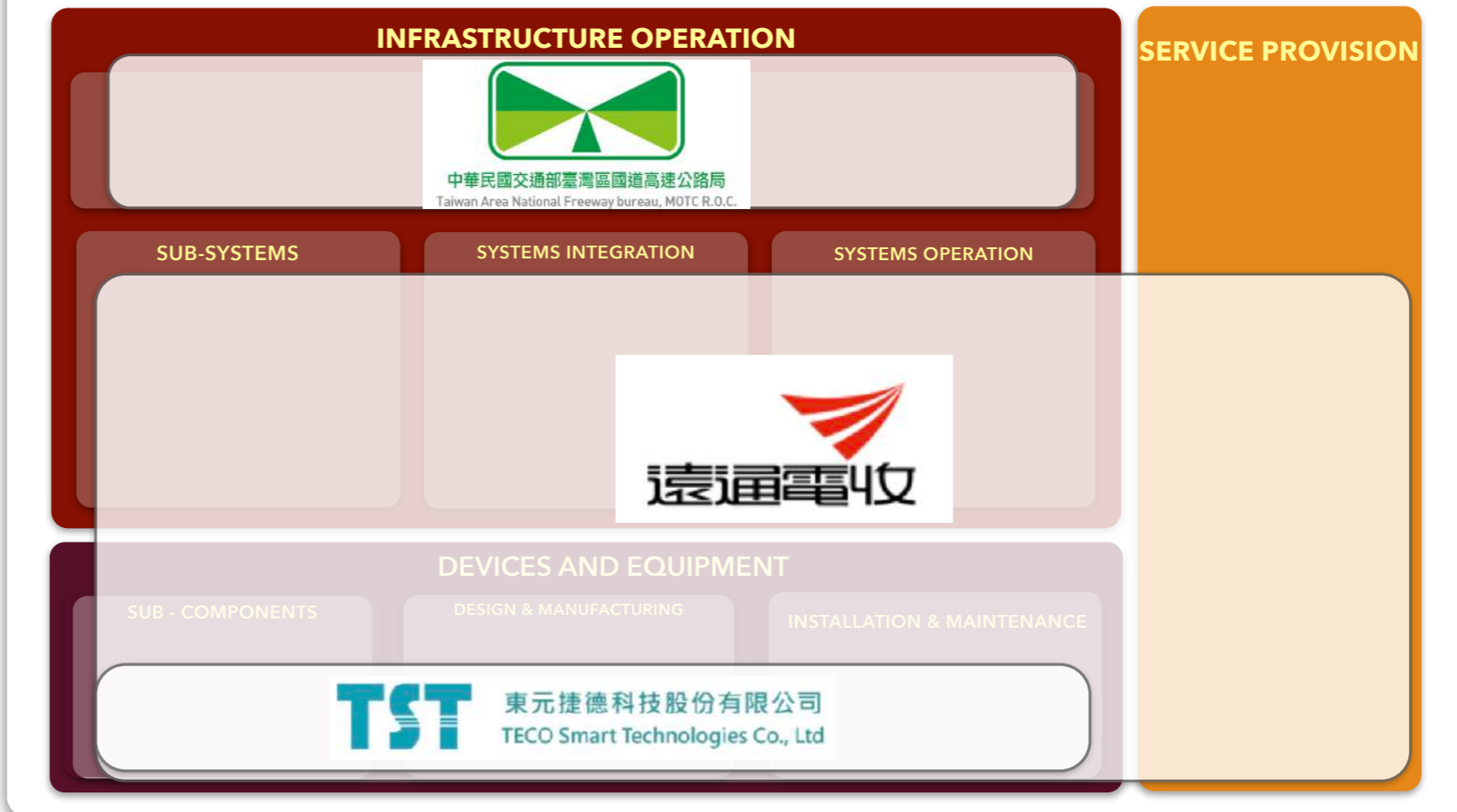
TECO Smart Technologies is in charge of the design & manufacturing of the eTag device

FREE SAMPLE COUNTRY PROFILE



- **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

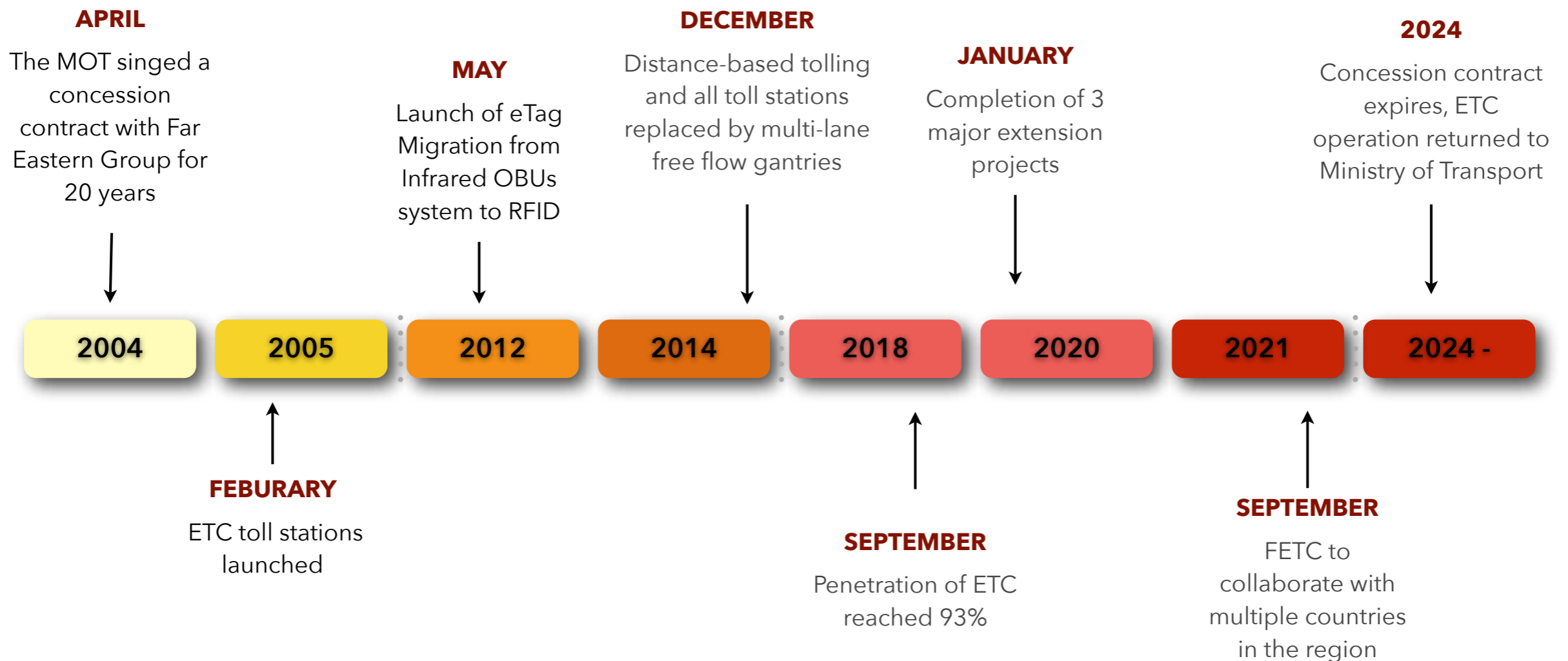
- Value-added services are accessible on the app including vehicle accessory **e-shop, roadside assistance, designated driver service**, etc.



FREE SAMPLE COUNTRY PROFILE

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

Taiwan tolling timeline



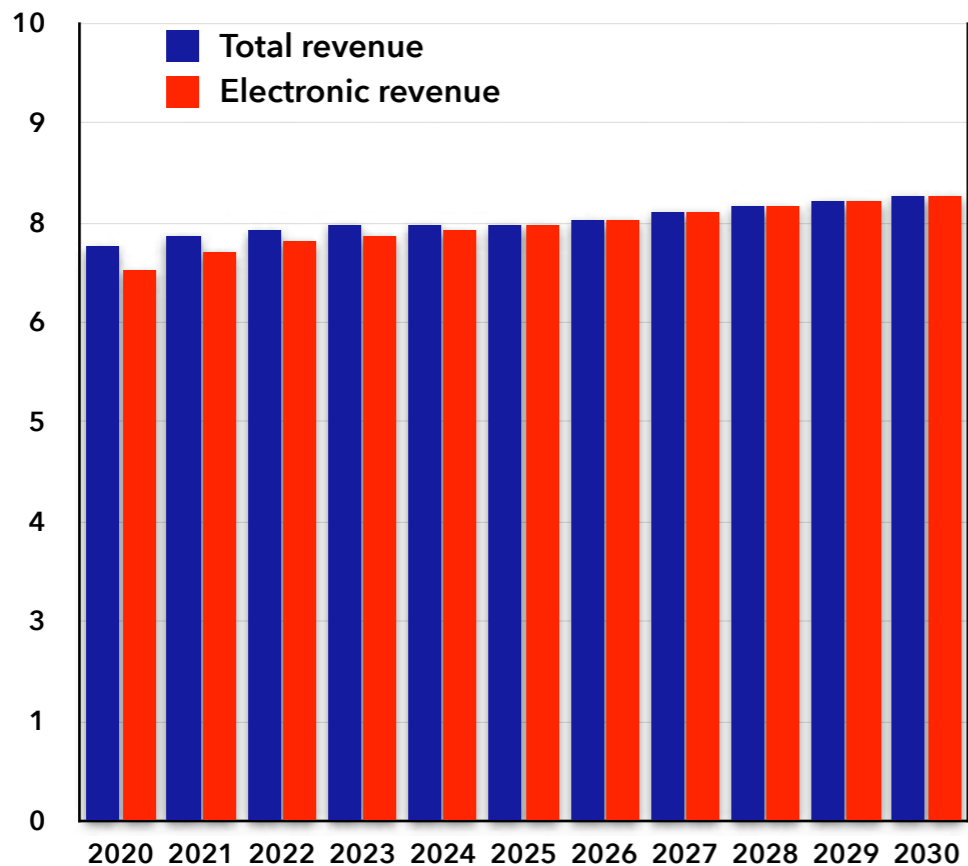


Tolls will be 100 % electronic from 2025 on

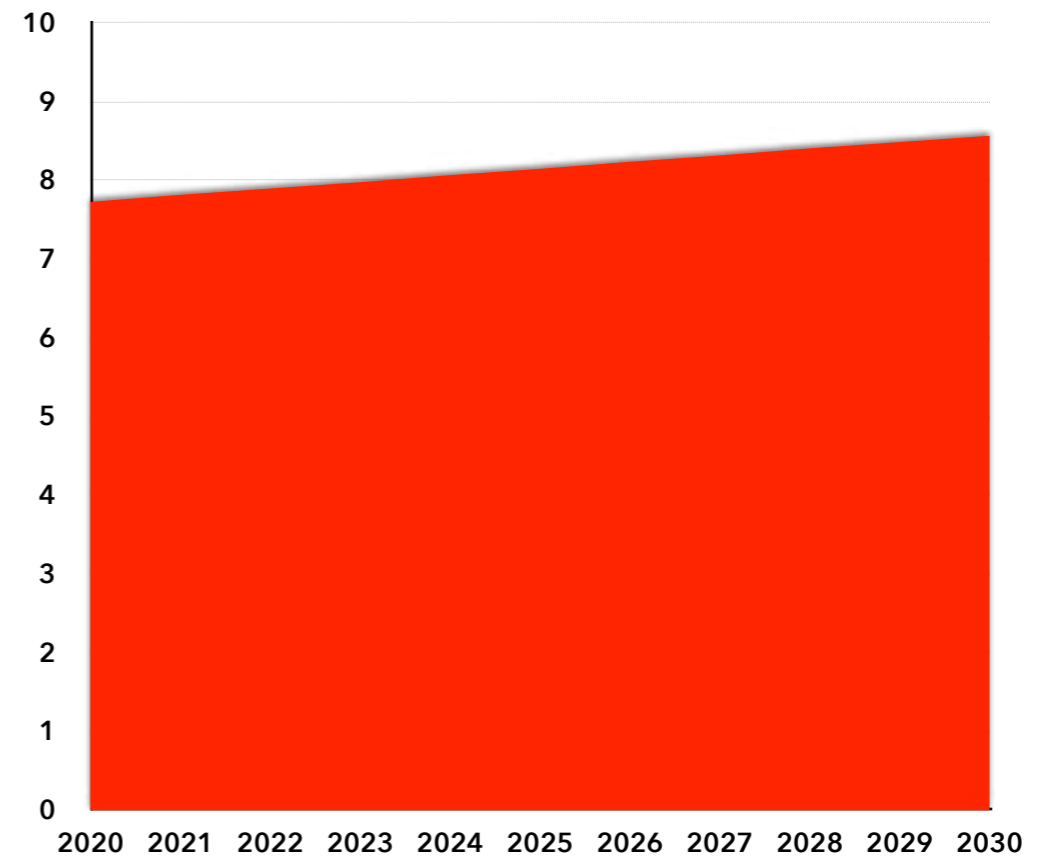
FREE SAMPLE COUNTRY PROFILE

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

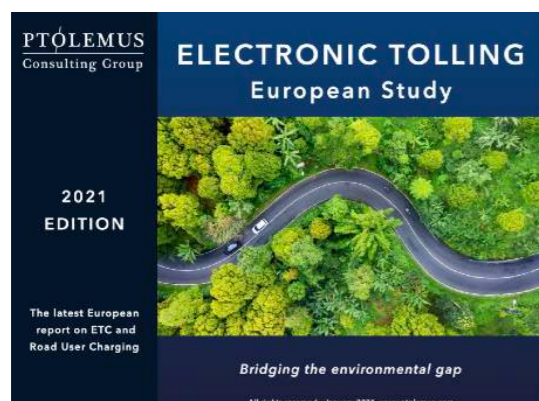


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Report pricing



The study comes with a single, worldwide company licence



The global reference report on ETC and road user charging

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	Buy direct (Invoice)	Buy online (Visa or MasterCard)	
Contents	<ul style="list-style-type: none"> • 560-page study with 32 country profiles, including qualitative, competitive and value chain analysis • Service provider best practices • Interoperability models analysis • Smartphone-based tolling model analysis • In-depth regional assessment 	<ul style="list-style-type: none"> • Excel file with outputs and charts • Estimates of the subscription volumes by technology and vehicle type • Devices sold, total revenues collected and ETC-only revenues 	
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