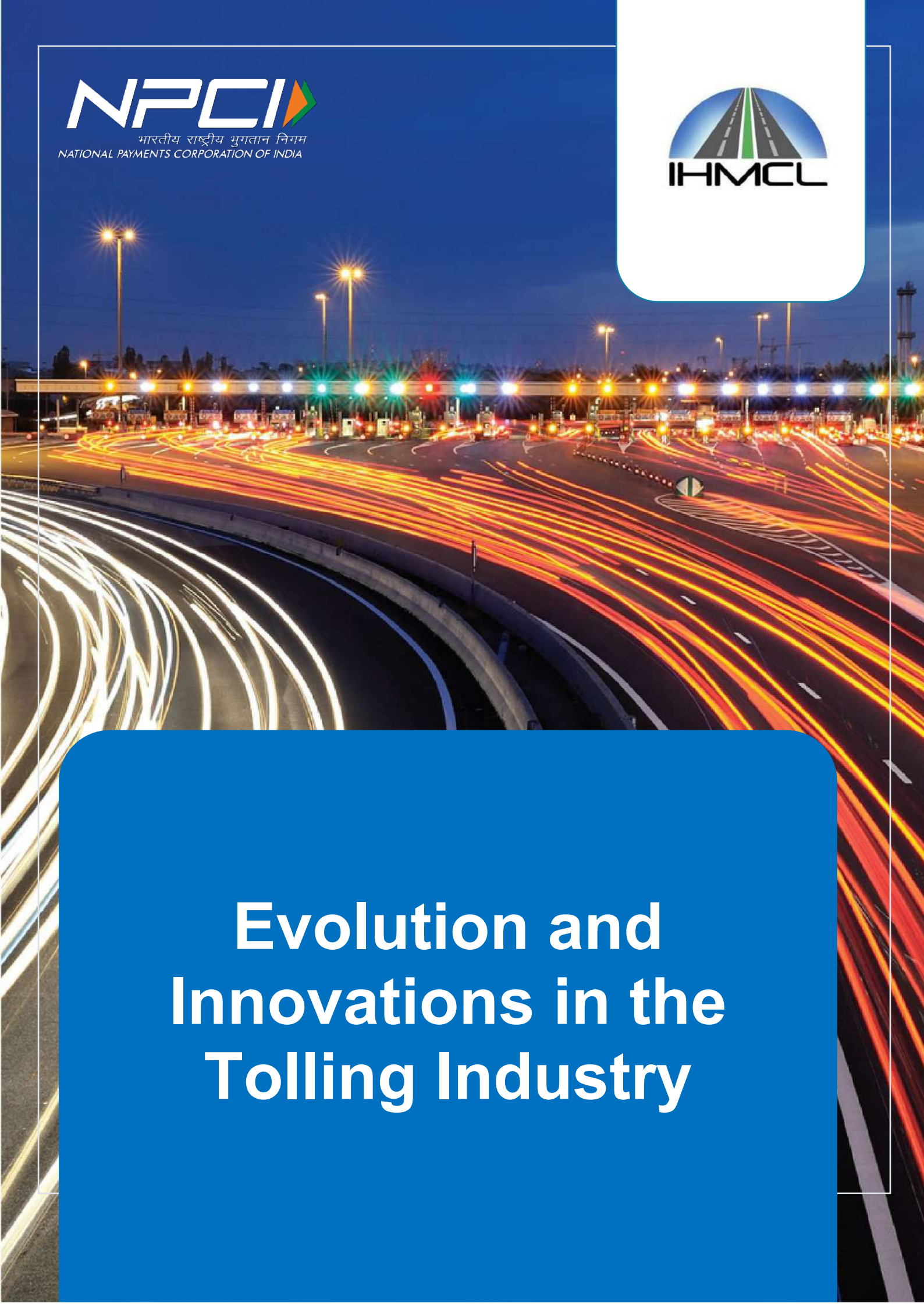
NPCI
भारतीय राष्ट्रीय भुगतान निगम
NATIONAL PAYMENTS CORPORATION OF INDIA

IHMCL



Evolution and Innovations in the Tolling Industry

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1. Executive Summary

India is experiencing significant expansion in its road network along with growth in the automotive industry. This surge is fostering the adoption of intelligent transportation systems, including toll management systems, advanced traffic management systems, deployed on highways and expressways, and integrated transit management systems operating in urban regions. This whitepaper is intended to discuss the evolving global tolling landscape with a deep dive into the Indian Tolling System.

Over time, the worldwide road network has seen constant enhancements to manage congestion. The tolling systems across the globe have revolutionized and undergone a remarkable transformation by incorporating advancements such as Automatic number plate recognition systems, and electronic toll collection supported by digital payment solutions. Tolling systems are crucial in financing transportation infrastructure, managing traffic, and maintaining existing facilities by collecting fees from users of specific roads, bridges, tunnels, and other transportation facilities.

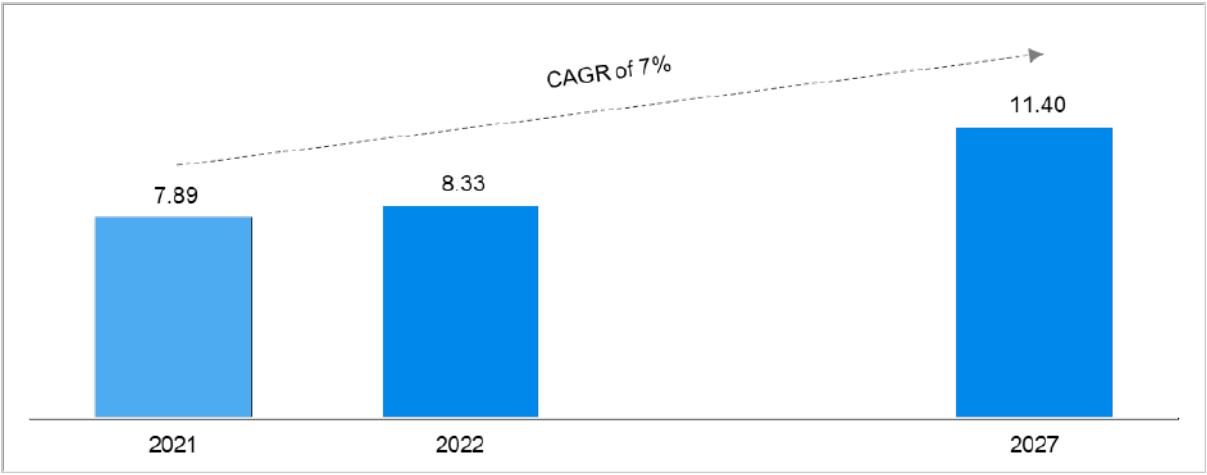
India is taking leaps in making tolling systems efficient, effective, and transparent. There is a shift to align towards the global trend of acceptance and adoption of intelligent transportation systems. The establishment of Indian Highway Management Company Limited (IHMCL) and mandating of NETC FASTag has not only played a pivotal role in helping digitization of the Indian tolling ecosystem but also changed the consumer mindset towards the adoption of digital payments in other ecosystems like parking, fuel stations, etc. This was possible due to the creation of the National Electronic Toll Collection (NETC) by NPCI in 2016 after IHMCL approached NPCI to create an interoperable solution for the FASTag Programme.

NETC FASTag's scope is broadened to encompass a wide range of services such as fuel payments and has a use case for several other services. These technologies would further lead to a reduction in greenhouse gas emissions due to less idle time for vehicles at the toll plaza, ensure smooth governance of the tolling systems nationwide, and minimize revenue leakage. Modern systems can also allow the reduction of toll evasion and improve the tolling system for efficient fleet management and timely upgradation of the infrastructure, software, and backend systems. This can lead to the creation of an entirely new ecosystem to facilitate new development and growth comprising of Fintech players for facilitating data monetization, credit for users, reward systems for following traffic, and roadside assistance service providers amongst several others.

2. A Comprehensive Look at the Global Tolling Systems

2.1. Exploring the Global Tolling Industry

Tolling techniques used to levy tolls on roads, bridges, and tunnels have changed dramatically in the last 30 years. The efficient movement of vehicles on tolled roads and transit is likely to continue evolving, because of the involvement of technology which plays a significant role.



The technological advancements towards the ETC System have not only accelerated traffic flow but also preserved valuable travel time, curbed revenue leakages, contributed to curbing air pollution by reducing vehicle emissions, and helped in better management and monitoring of toll plazas. Consequently, tolling operations consistently exhibit heightened accuracy and reliability, while the likelihood of errors reduces. Additionally, innovative technologies are being seamlessly integrated into transportation infrastructure, further propelling the evolution of the tolling industry.

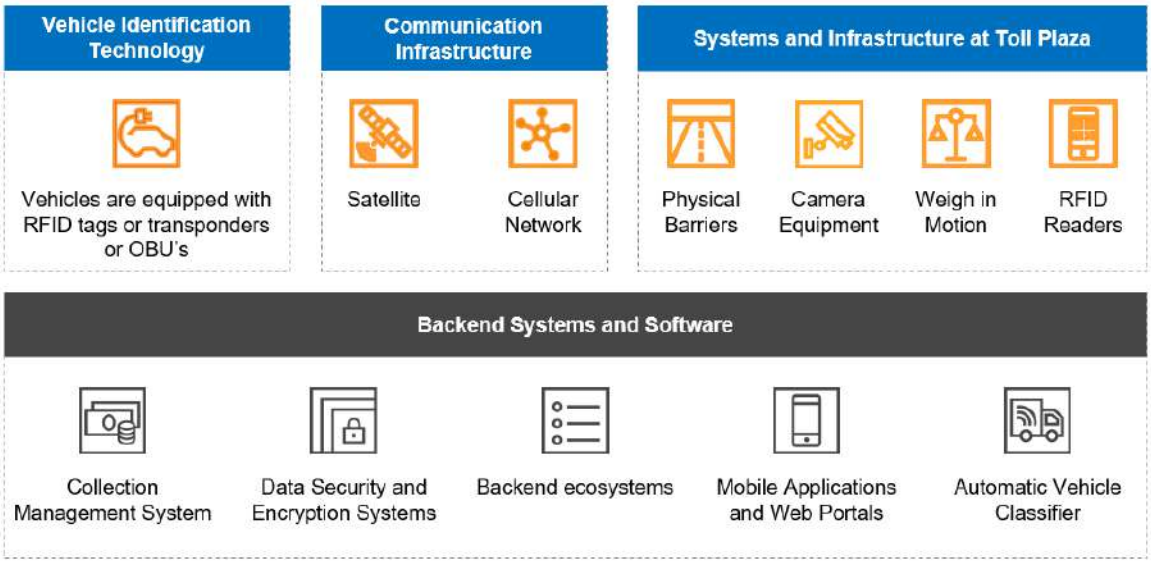
Even though modern vehicles emit fewer greenhouse gases and pollutants, carbon dioxide emissions from road freight transport are still rising, due to the surge in vehicles. As urbanization increases, it brings complexities to suburban sprawls and generates significant carbon emissions. The advancements in tolling induce efficiency in the existing tolling ecosystem and ensure that wait time is reduced on the toll plaza which in turn helps in logistical efficiencies across the nation. The focus is not solely on smart cities but on creating sustainable cities in every sense. As technology continues to evolve, toll authorities can explore further improvements to enhance the movement of people and goods on roadways. Additionally, the maintenance of infrastructure and traffic control requires significant investment[1], hence increasing the need for an efficient tolling system.

Distance-based tolling systems are gaining popularity, offering a fairer pricing mechanism based on the distance traveled and promoting efficient road usage. These advancements have led to peak efficiency in current roadways, transforming the tolling landscape and ushering in a new era of electronic toll collection.

[1] https://www.t-systems.com/de/en/industries/public-sector/intelligent-toll-systems

Tolling Infrastructure, Sub-systems, and Components

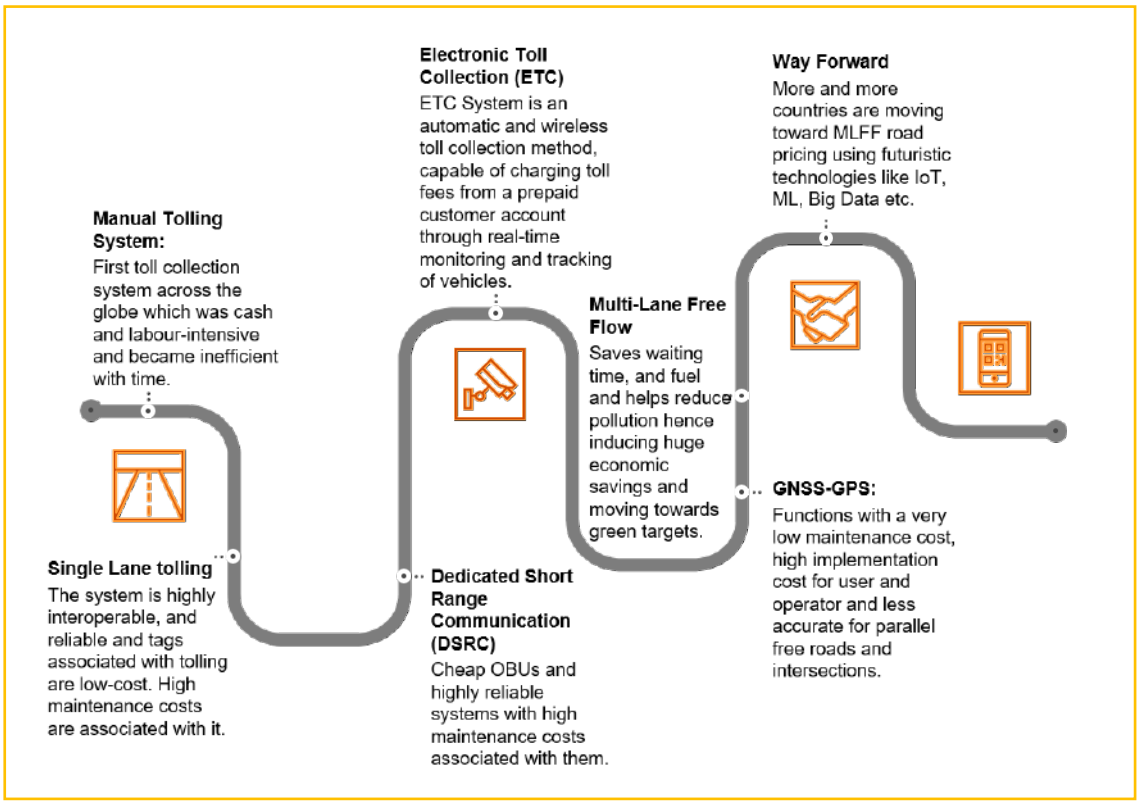
The tolling sub-systems support traffic management, and accurate cash collection and provide a seamless experience to users while ensuring that privacy and data security are maintained to the highest standards



2.2. From Manual Tolling to Seamless ETC Systems

1. Evolution of Tolling Systems

Manual tolling systems were the old tolling system that evolved into single-lane free flow with barriers and post-introduction of technological advancements such as DSRC, RFID, and GNSS, single-lane free flow. Current tolling is based upon multi-lane free-flow methodology systems.



2. The Evolving Landscape of Toll Payment Choices

The payment methodology and systems have evolved a lot from cash collection where manual intervention was needed to a card-based closed loop system where the user uses the card to tap-n-go.

Leveraging RFID for vehicle identification marked a milestone in tolling advancements. RFID-enabled linking with various payment systems such as **closed loop, semi-closed loop, and open loop**. With RFID technology in place for vehicle identification, users can use interoperable tags linked to their bank accounts or prepaid wallets for automatic toll deductions, eliminating the need for physical cards. Now there is a need to make it more convenient for the users by allowing the linkage of tolling systems with preferred payment methods (credit cards, etc.).

3. Exploring International Tolling System- Case Studies

Canadian ETC system uses RFID-equipped transponders attached to vehicles that engage with infrastructure to automatically deduct toll fees from prepaid accounts. The system aims for interoperability among provinces, allowing unified tolling accounts to enhance users' ease and seamless travel. Users manage ETC accounts online via dedicated websites/apps, for tasks like fund additions and reconciliation. Dynamic pricing adjusts toll rates based on live traffic, during peak hours to optimize traffic flow.

Malaysia's ETC system is known as "**Touch 'n Go**" (TNG) which supports a free-flow tolling system. RFID technology is used for the toll collection process. Vehicles are equipped with RFID tags/stickers on vehicles. User's pre-load credit into the RFID tags or link their tags to credit or debit cards for automatic top-ups.

Germany's ETC system is called "**Toll Collect**" which is primarily used for tolling of heavy goods vehicles (HGV's) on federal highways in Germany. The tolling system works on features and criteria like Distance-Based Tolling, On-Board Units (OBU), and Toll Road Networks, and is interoperable and integrated with neighboring nations tolling systems, like Austria and Belgium which allows seamless travel and toll payment across borders.

Australia's e-TAG is used for building a free-flow toll collection system based on RFID-based transponders and Dedicated Short Range Communications (DSRC) protocol. It is interoperable and comprises of sensor & DSRC module used to gather user data at toll booths to detect the e-TAG, calculate the toll amount, and deduct it from the prepaid account. If the system does not detect the vehicle, License Number Plate Recognition is used to check registrations against the government database.

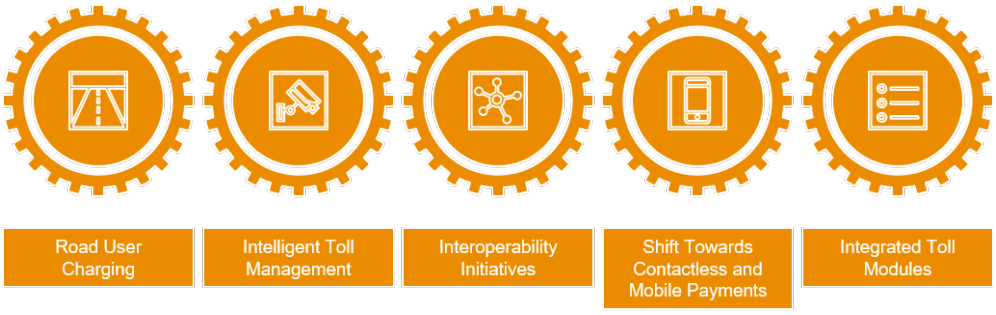
Singapore launched its **Electronic Road Pricing (ERP)** in 1998 which was based on both smart cards and RFID-based methods. The readers for the free flow are located along the side of the road and the user and vehicle data is read by making use of the smart card or the OBU. Every time the vehicle crosses the toll, money gets deducted based on the type/categorization of the vehicle. The smart card and OBU can be linked to prepaid accounts and users' bank accounts as well.

2.3. Assessing Tolling's Influence on Environment, Society, and Governance

With climate resilience, swift carbon reduction efforts and an expanded emphasis on sustainability becoming central priorities for governments globally, tolling and road user charging are poised to play a significant role in generating the substantial funds required to bolster investments in more sustainable infrastructure.

- **Environment:** The environment-related benefits come directly in the form of reduced air and noise pollution contributed by the less wait time (idle time) spent at the toll stations[2]. In 2014, the waiting time at toll plaza was 734 seconds which has reduced to 47 seconds in 2023[3]. Governments around the world are proactively working towards reducing the emissions produced due to vehicles as was observed at the COP26 summit. India has set a target of reducing the emission intensity of its GDP by 45% by 2030[4].
- **Social**: Toll amounts charged are utilized to ensure that highway infrastructure is well-maintained. Thus, tolling systems have a significant impact on society as they help minimize accidents and promote public health and safety. This also helps in reducing the idle time spent by drivers on the tolling infrastructure. Tolling has a positive social impact as it improves transportation infrastructure as the revenue earned is used for the maintenance of highways and roads which enhances traveling, jobs, essential services, healthcare, and education.
- **Governance:** Robust mechanisms for customer issue redressing become necessary as the incidents of road rash have been seen rising in the past few years. To further strengthen the governing of the tolling sector, revenue leakage can be reduced by further enabling the placement of cameras at junctions where vehicles tend to leave the roads. Traffic congestion on the roads can be handled well with intelligent road tolling systems that cater to a customs fee which is calculated on the class of a vehicle and the distance traveled.

2.4. Exploring Key Trends in Tolling Systems



- In the **Road User Charging** system fees are collected for using specific roads or transportation infrastructure using various pricing models, like the congestion charge, distance-based charge, smart pricing, and dynamic pricing based on factors like time of day and vehicle type.

[2] https://www.moneycontrol.com/news/business/fastag-led-to-rs-2800-crore-in-fuel-saving-due-to-reduced-idling-of-vehicles-at-fee-plazas-govt-8954191.html
[3]https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1935658#:~:text=The%20minister%20further%20informed%20that,by%202030%2C%20Shri%20Gadkari%20added.
[4]https://pib.gov.in/PressReleasePage.aspx?PRID=1795071#:~:text=Reach%20500GWNon%2Dfossil%20energy%20capacity,by%202030%2C%20over%202005%20levels.

- **Intelligent Toll Management** refers to advanced & technology-driven toll management with the utilization of various technologies including sensors, cameras, data analytics, automation, etc.
- **Interoperability** emerged as a crucial trend in the tolling industry globally, enabling drivers to use a single toll account across tolling systems and nations.
- **Shift Towards Contactless and Mobile Payments:** Tolling authorities now embrace mobile payment apps and digital wallets for seamless and cashless toll transactions, especially during the COVID-19 pandemic. E.g., NETC FASTag in India.
- **Vehicle-integrated toll module technology** enables integration of tolling systems directly into vehicles, enabling seamless and automatic toll payment without the need for external tags or transponders. E.g., Built-in ITM in Audi which allows users to access toll booths in parts of the USA, Canada, and Mexico[5].

Incorporating technological advancements, global tolling systems have streamlined operations with free-flow methods and expedited toll payment through digital options, minimizing wait times. Furthermore, there's a concerted effort to address ESG impacts, resulting in the implementation of robust mechanisms to ensure sustainability. Several key trends and innovative methods of tolling have been incorporated - such as integrated toll modules making way for intelligent toll management systems.

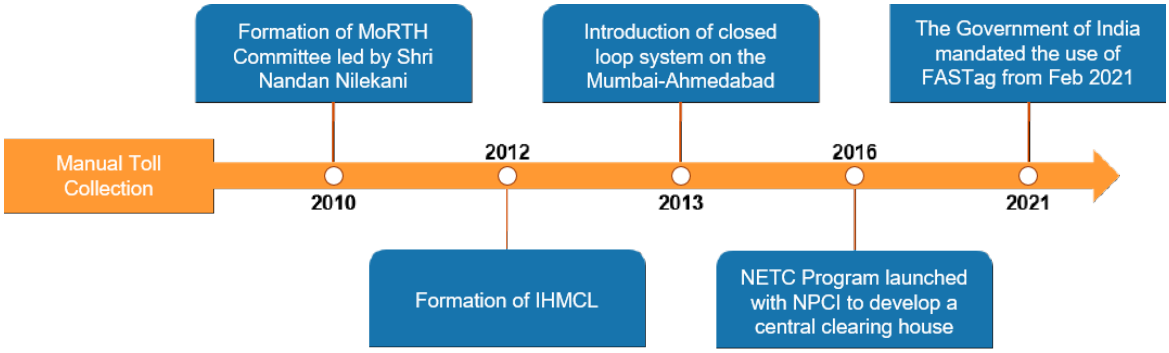
[5] https://www.audicharlotte.com/vehicle-integrated-toll-technology.htm#:~:text=The%20ITM%20is%20a%20toll,parts%20of%20Canada%20and%20Mexico.

3. Unveiling the Tolling Industry's Journey in India

3.1. Outlining the Background and Growth of Tolling

The Indian tolling industry plays a critical role in the maintenance and expansion of extensive road networks in addition to facilitating the ever-growing demands of transportation. With a vast network of national and state highways, expressways, and bridges, toll collection has emerged as a significant source of funding for the development and maintenance of the road network.

The National Highways in India hold a vital position in driving the nation's economic and social progress. By ensuring the smooth flow of goods and passengers, they contribute significantly to enhanced market accessibility. As of November 2022, the total length of National Highways in the country reached 1,44,634 kilometers[6], highlighting a remarkable growth of about 59%[7] in the last nine years. This expansion has propelled India to possess the second-largest road network globally.



The tolling industry traditionally relied on **manual toll booths**, where the collection systems had lack of the technology and support sub-systems. This impacted transaction time, left scope for evasion, involved cash management causing bottleneck issues, and increased the idle time on highways while declining service quality.

The evolution of tolling in India started in **2010** with the formation of the Ministry of Road Transport and Highways of India i.e. (**MoRTH)** committee led by Chairman Shri. **Nandan Nilekani**[8] to pave the way for forming a unified electronic toll collection technology for national highways and suitable for implementation of the same throughout India, keeping in mind interoperability and nationwide implementation. The committee submissions involved a list of **recommendations** including a centralized debit/credit mechanism, inexpensive sticker tags, RFID-based Electronic Product Code (EPC), tag holders' queries through the web, Email, mobile, etc. The recommendations also included tag systems to be used for other applications such as parking, vehicle tracking, and traffic enforcement. The recommendations were captured and released as specifications for the ETC system by MoRTH under Gazette Resolution No.209-H-25011/4/2011 and the mandate for ETC implementation at NH Plazas was given to NHAI.

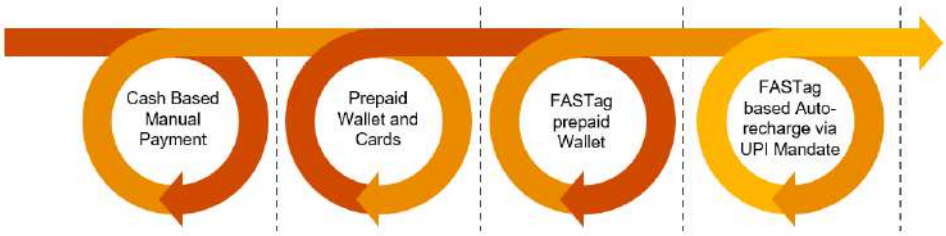
In **2012**, Indian Highways Management Company Limited i.e. **IHMCL** was formed to carry out the objectives of electronic tolling and other allied activities alongside NHAI. A closed loop ETC was introduced between Mumbai and Ahmedabad in **2013** which included 3 logistic providers and about 6 toll plazas.

In **2016**, IHMCL approached NPCI to develop an interoperable solution for the FASTag Program. With the objective of having a central clearing location for toll transactions that ensures

[6] https://pib.gov.in/PressReleasePage.aspx?PRID=1888480
[7] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1935658
[8] https://morth.nic.in/sites/default/files/Toll-2010.07.07-Implementation%20of%20ETC%20system.pdf

interoperability, **NPCI** launched the National Electronic Toll Collection (**NETC)** platform. While a few closed-loop systems existed in certain areas, no standard national-level solution existed. The toll collection has been revolutionized by the NETC FASTag system and continues to provide a more convenient, scalable, interoperable, and efficient tolling experience amongst road users and toll authorities, along with multiple partners within the ecosystem.

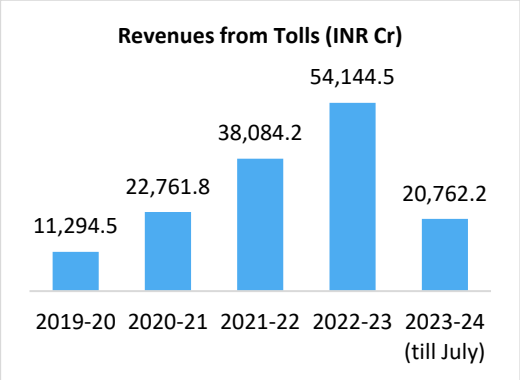
The toll payment options have also evolved over the years from traditional cash-based systems to prepaid cards, debit cards, payment wallets, etc. UPI and BPPS-based recharge are amongst the key enablers in maintaining sufficient balance in the NETC FASTag ecosystem and providing a seamless payment experience.



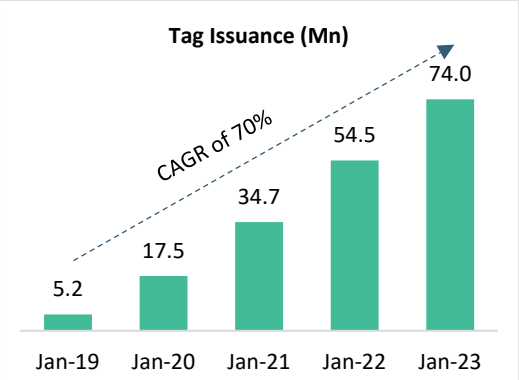
3.2. NETC FASTag: Paving the Way for Revolutionary Toll Collection

The NETC FASTag toll-collecting system has seen significant success in India and is experiencing a consistent growth trend.

There has been a substantial increase in revenue from INR 3,352 Crore in FY18 to INR 54,144 Crore in FY239, reflecting the wide acceptance and adoption of tolling systems across national highways, contributing to the country's economic growth and infrastructure development[10].



Source: NPCI



Source: NPCI

Since February 2021, the number of toll plazas under the NETC FASTag has increased from 770 to 1,228, including 339 state toll plazas[11]. The NETC has 38 banks live on its platform[12],

9 https://www.npci.org.in/what-we-do/netc-fastag/product-statistics

10 https://www.aninews.in/news/business/business/centre-sets-13800-km-highway-construction-target-for-2023-24-union-minister-nitin-gadkari20230720165624/#:~:text=Further%2C%20Gadkari%20said%20with%20the,Rs%20130%2C000%20crore%20by%202030.

11 https://pib.gov.in/PressReleasePage.aspx?PRID=1921359

12 https://www.npci.org.in/what-we-do/netc-fastag/product-statistics

leading to an improvement in user experience by providing more options at NH Fee Plazas. The daily toll collection via the NETC FASTag system reached an all-time high of Rs 193.15 crore on April 29, with 1.16 crore transactions recorded in a single day[13].

> "The use of FASTags has saved 70 thousand crore rupees in wasted fuel expenses caused by waiting at the toll plazas"
> - Nitin Gadkari, Road Transport and Highways Minister

The efficiency of toll operations has been enhanced, leading to a more accurate valuation of road, attracting further investment in India's highway infrastructure, due to consistent and advanced adoption of the NETC FASTag by highway users.

NETC FASTag has not only increased the effectiveness of toll collection but also enabled contactless payment for parking fees that is seamless and secure at over 220 parking lots in over 9 states[14] and 50+ cities across India[15].

3.3. Navigating Through Prevailing Challenges of NETC FASTag

While the NETC FASTag ecosystem has gained significant momentum and evolved there are still a few challenges that need to be relooked.

Evasion by drivers

Evasion occurs when vehicles use alternative routes to enter and exit the Highway without paying toll charges, posing a problem for toll collection efficiency and project sustainability.

Low balance and blacklisted tags

Low balance tags have funds below the set threshold. Owners are notified to recharge FASTag wallets. Blacklisted tags are requiring users to make cash payments at toll plazas.

Violation Management and double debit

Several unauthorized deductions or double debit types of transactions occur owing to technical issues at the toll plaza.

Infrastructure Maintenance and Upgradation

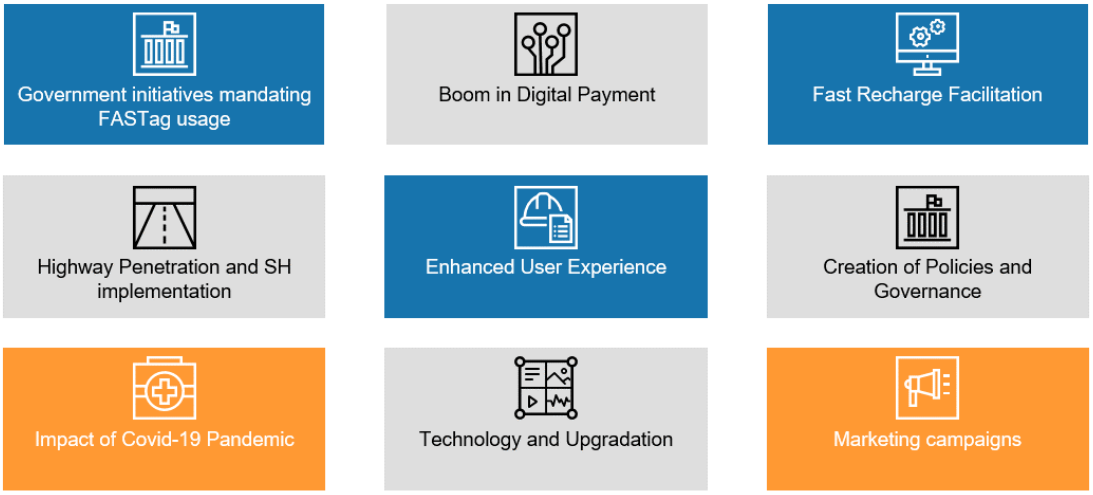
The implementation of the FASTag infrastructure involves a range of costs associated with deploying the necessary technology and infrastructure

Lower adoption at state highways

Although the program covers almost all national highways, the system is adopted at very few state highways. Expansion of the NETC infrastructure to these state and city toll plazas is need of the hour.

13 https://www.indiatoday.in/india/story/nhai-fastag-daily-toll-collection-hits-record-high-crosses-193-crore-mark-2367858-2023-05-03
14 https://www.bankbazaar.com/driving-licence/how-to-use-fastag-to-pay-parking-fees.html
15 https://www.pwc.in/assets/pdfs/the-indian-payments-handbook-2022-2027.pdf

3.4. Factors Contributing to NETC FASTag's Success



In November 2020, the government amended the Central Motor Vehicles Rules, 1989, making NETC FASTag mandatory for registration of all new four-wheeled vehicles since 1st December 2017[16]. This was done to ensure that all new vehicles were equipped with the necessary technology for seamless toll collection right from the start, further accelerating the adoption of NETC FASTag.

NETC FASTag has helped users save precious time on the toll plazas. Due to faster and cashless collection time, the system has induced transparency for both users and government agencies while ensuring a reduction of traffic congestion.

Amongst other benefits, NETC FASTag has helped in reducing vehicle pollution, improving safety and convenience for users, and ensuring that revenue leakage is minimized by using technology at its forefront. The ease of obtaining and using a NETC FASTag has been a compelling factor in driving its popularity. The average wait time at tolls has been reduced from 8 min to 47 secs post-NETC FASTag implementation.

Other major initiatives contributing to this success are:

- **Cashback for payments through NETC FASTag:** Initially, MoRTH, NHAI, and IHMCL attracted users by giving 10% discounts to users. Some of the Member entities are still providing periodic discounts to promote digital transaction transactions.
- **NETC FASTag in INR 100.** NHAI has fixed capped the purchase amount of NETC FASTag at INR 100. The affordable price point has been a very important factor for adoption by users.
- **Inclusion of Monthly passes and Local Exemptions:** IHMCL and NPCI have facilitated easy monthly passes and local exemptions on NETC FASTag. This helped acquire frequent and local commuters and onboard them on NETC FASTag.
- **Easy recharge facilitation:** NPCI and Member entities have ensured multiple recharge modes as a key feature of NETC FASTag. Users can recharge via several recharge options such as mobile apps, UPI, BBPS, credit/debit cards, and net banking.
- **Inclusion of State Highway Plazas:** Scheme Guidelines for Inclusion of State/City Toll Plazas was released and launched by the Hon'ble Minister of Ministry of Road and Transport & Highways (MoRTH) in January 2019. Subsequently, IHMCL extended the

[16] https://pib.gov.in/PressReleseDetailm.aspx?PRID=1683339

Scheme Guidelines on two occasions till 31st March 2022 by providing financial assistance to various state authorities. This move offered different state authorities a shorter turnaround time by allowing them to work within the robust NETC FASTag solution architecture.

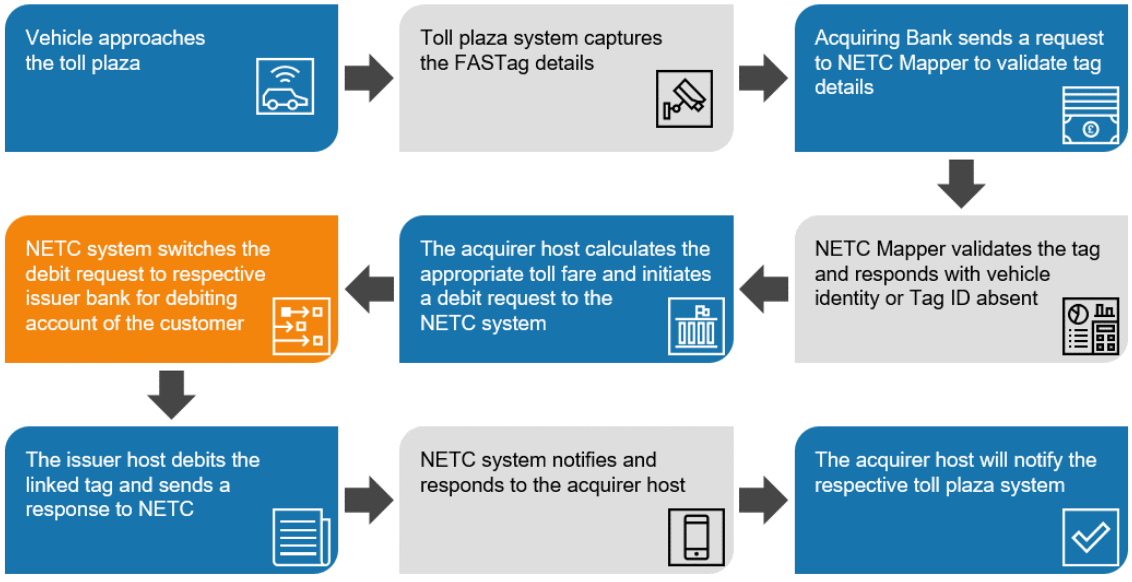
- **Inclusion of Parking Plazas:** Under IHMCL's commitment to "One Nation One FASTag", IHMCL, with the help of NPCI, has created a Parking Policy for easy adoption of NETC FASTags across Parking plazas in the country.
- **Policy interventions:** Policies, such as Tag Closure and replacement policy, Manual Transaction policy, Dispute Management guidelines, and VRN update policy, have been at the core of the success of NETC FASTag as they've been the driving force to create, guide and enable an entire ecosystem.
- **ICD 2.5 Mandate:** Upgradation of toll plaza infrastructure for conversion from secure file transfer protocol (SFTP) to application programming interface (API) based systems via ICD 2.5 mandate by IHMCL and NPCI.
- MoRTH, NHAI, IHMCL, NPCI, and Member entities had several marketing campaigns throughout the nation for NETC FASTag were a major success driver.

4. Exploring the NETC FASTag value chain

4.1. Transaction Flow of NETC FASTag

4.2. Reasons for FASTag to leverage the RFID technology

NETC FASTag makes use of RFID technology for facilitating toll payments directly from the linked prepaid instrument



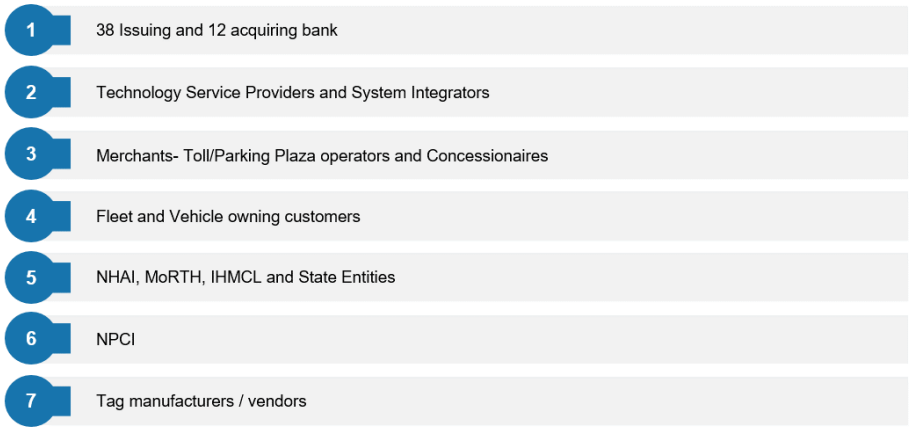
- RFID enables **contactless communication between the toll plaza infrastructure and the NETC FASTag** on the vehicle, promoting a smooth flow of traffic and reducing congestion at toll plazas.
- As the vehicle approaches the toll plaza, the RFID reader can **instantly read the unique identifier on the NETC FASTag** via a scanner which has a range of 3.6 meters, deduct the toll amount from the user's account, and open the toll barrier in a matter of seconds, **enabling seamless travel**.

- RFID is a widely adopted and standardized technology, making it **easily scalable and interoperable** across various toll plazas and road networks. A single RFID-based NETC FASTag can be used for toll payment at multiple toll plazas, offering convenience for users and promoting a uniform toll collection system nationwide.
- **payment at multiple toll plazas**, offering convenience for users and promoting a uniform toll collection system nationwide.
- RFID technology is an attractive choice for large-scale tolling projects and offers a **cost-effective solution** that is simpler to implement and maintain when compared to other technologies
- Offers a high degree of **authentication and security**, making it more difficult to counterfeit.

The toll industry in India is experiencing rapid growth, largely due to the implementation of FASTag for toll collection across the country. This has been further driven by the mandatory use of FASTag nationwide, as well as high adoption rates and improved user experience. There is potential for FASTag to expand into both retail and commercial sectors. Additionally, the impact of Covid-19 has also played a role in the industry's growth. While FASTag has been able to solve many challenges, some issues persist. There is a need to look ahead and develop an effective and responsive system to manage congestion – one that is less costly to build and maintain, requires a shorter lead time to implement and helps increase efficiency and reduce time.

4.3. Impact of NETC FASTag Across Stakeholders

NETC FASTag's impact on various industries has been transformative, reshaping the payment landscape, driving digitization, and fostering innovation across sectors. As its potential continues to be unlocked, NETC FASTag has a major role to play in driving India's journey towards a digital-first economy.

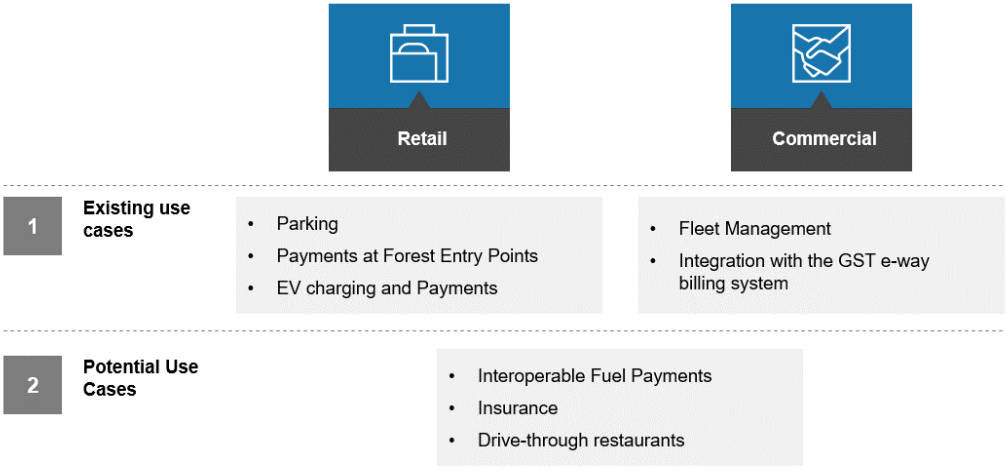


- **Increase in Government Revenue and Efficiency:** NETC FASTag has increased revenue and reduced overheads and losses associated with manual tolling. The revenue earned is used for infrastructure development and road maintenance and once the highway's building cost is recovered, the toll fee is reduced at the rate of 40%[17] for maintenance. Hence, benefiting the construction and engineering sectors. NETC FASTag has also brought transparency and reduced corruption in toll collection.
- **Bank and FinTechs:** NETC FASTag and near real-time transactions have transformed payments by eliminating cash handling and reconciliation complexities.

17 https://morth.nic.in/toll

- **Transportation and Logistics Industry:** NETC FASTag has improved transportation and logistics by managing congestion and increasing efficiency. Cashless payments mean faster movement of goods on highways, improved traffic flow, and lower logistics costs for businesses. NETC FASTag allows users to transfer a part of their expenditure into the digital mode by using it, hence benefiting fleet owners[18] which is a boon for the logistic industry amongst others.
- **Parking fee Payment:** NETC FASTag is now used for cashless payments at parking lots, expanding the scope of digital payments and contactless transactions. This has not only made parking more seamless and hassle-free but also contributed to the growth of cashless retail transactions.
- **End users:** NETC FASTag enables automatic toll payments, saving time for drivers and reducing traffic congestion. The waiting time at plazas has been reduced to 47 seconds in 2023 from 734 seconds in 2014[19].
- **Benefits for the Toll operators:** Toll transaction processing time has been reduced significantly due to the implementation of the NETC FASTag system at toll plazas which is enabling a fuller plaza operator to operate at higher throughput translating to an increase in productivity compared to the manual fee collection system.
- **Environmental Benefits:** NETC FASTag usage has led to significant environmental benefits, including an estimated annual fuel savings translating to more than INR 70,000 crore due to reduced idling of vehicles at toll plazas. Moreover, the adoption of NETC FASTag at fee plazas along highways has resulted in a reduction of over 9,78,200 tonnes of CO_2 emissions[20].

4.4. Beyond the Tollbooth: Exploring Extended Applications of NETC FASTag



By integrating NETC FASTag into different sectors, there are possibilities to unlock seamless and contactless payment experiences, optimize traffic management, and promote a cashless ecosystem. Some of the use cases are:

18 https://truckguru.co.in/blog/the-habituating-process-of-the-transporting-industry-with-fastag-in-india-2/#:~:text=They%20have%20been%20able%20to,cases%20that%20benefit%20fleet%20owners.
19 https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1935658#:~:text=The%20minister%20further%20informed%20that,by%202030%2C%20Shri%20Gadkari%20added.
20 https://www.thehindubusinessline.com/companies/fastag-collection-on-nhs-at-33274-crore-in-fy22/article65726546.ece

Retail Use cases

1. Parking Fee Payments

In 2019, the government started a pilot project for using NETC FASTag for parking purposes at Hyderabad Airport. The solution led to an increase in the airport's parking revenue by 30-40 % with a 100 % vehicle count and accurate time spent by each vehicle[21]. As a part of India's drive for cashless payments, expansion plans for widespread acceptance are underway. This use case has the following benefits:

Parking Fee Payments

The NPCI launched a FASTag-based parking facility in 2021, wherein a user can pay the parking fee at metro stations, malls, hospitals, tech parks, business parks, etc., using the existing FASTag placed on the vehicle.

- Provides real-time data regarding vehicles parked, daily collections, etc. for parking lot operator
- The exchange and handling of cash has been reduced
- Increase in float/interchange income for issuers due to the availability of easy recharge option and interoperability at multiple parking spaces, driving customers to keep a large balance in the tag

2. Payments at Forest Entry Points

In April 2023, IHMCL signed an MoU with Nagarjunasagar-Srisailam Tiger Reserve[22], spanning Andhra Pradesh and Telangana to implement NETC FASTag-based payment systems at forest entry points. This initiative aims to facilitate seamless entry for vehicles into the reserve and allow the collection of Ecosystem Management Coordination (EMC) fees via NETC FASTag at various entrance points. The adoption of NETC FASTag-based payments, prevents visitors from standing in long queues and facing delays, thereby ensuring a seamless experience. Moreover, this partnership promotes sustainable tourism and environmental preservation by reducing vehicular emissions at forest entry points.

Commercial Use cases

1. Fleet Management:

The solution serves as a central hub for all trip-related expenditures, including fuel, meals, parking, and miscellaneous purchases, streamlining operations effectively[23]. Key features that can be integrated:

- Ability to link multiple vehicles with a single account
- End-to-end expense management
- Single dashboard for reconciliation across toll, parking, fuel, and miscellaneous expenses
- Digital onboarding for drivers and vehicles
- Daily reporting and payment settlements for multi-vehicle accounts
- RuPay virtual/physical card linked with NETC FASTag account

2. **NETC FASTag integration with the GST e-way billing system:** Simplified the movement of goods by enabling automatic toll payments and real-time tracking of commercial vehicles[24]. This integration has streamlined the logistical operations while ensuring and enhancing the efficiency of the transportation of goods.

[21] https://www.livemint.com/news/india/hyderabad-airport-gets-complete-contactless-parking-using-fastags-11595034161874.html
[22] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1916587
[23] https://livquik.com/quikwallet-fastag/?utm_source=LinkedIN&utm_medium=Article&utm_campaign=ProdBlog1
[24] https://economictimes.indiatimes.com/news/economy/policy/e-way-bill-integrated-with-fastag-rfid-gst-officers-to-get-real-time-data-of-commercial-vehicles/articleshow/82764820.cms?from=mdr

5. Conclusion and Way Forward

The conventional manual toll collection method, which was prone to long queues and traffic congestion, has evolved into sophisticated electronic systems that revolutionize the way we pay for road usage. However, the persistent requirement for NETC FASTag-enabled vehicles to slow down at toll plazas due to barrier-based tolling hampers the seamless flow of traffic and adds to the frustration of drivers. Each vehicle added to a road during a given period increases the total travel time for all users, not merely by the amount of time of the added user, but by a fractional addition to the travel times of all other users.[25]

The efficiency of saving fuel and reducing time spent at the toll plaza in the future is an urgent need that should be considered while designing the future roadmap.[26] While the implementation of the ETC System has induced an efficient ecosystem, leading to faster throughput, minimizing time spent at tolling points, and reducing congestion substantially, there is still a long way to go. Many countries globally still do not have these tolling systems in place.

The evolution of DSRC technology, once a frontrunner, has encountered a shift in the market as RFID technology gains momentum. RFID's resilience in adverse weather conditions and its battery-free operation have positioned it as a practical choice. This shift has laid the foundation for free-flow tolling and MLFF integration, setting the stage for a more seamless and efficient tolling experience.[27]

The introduction of NETC FASTag in the Indian ETC system and the government mandate to make the NETC FASTag mandatory nationwide have played a key role in making tolling more efficient in India. NETC FASTag has led to minimizing idle time spent at toll plazas, reducing fuel consumption, and lowering emissions along with associated cost savings. NETC FASTag has helped in building an ecosystem around itself which has led to the emergence of various other use cases such as parking and EV charging.

As a next step, embracing free-flow tolling is a key step towards a seamless and sustainable tolling ecosystem. It will pave the way for a more efficient, convenient, and eco-friendly travel experience for users throughout India.

[25] https://www.businesstoday.in/latest/economy/story/toll-revenue-of-nhai-will-reach-rs-140-lakh-cr-in-3-yrs-gadkari-316417-2021-12-22
26 https://www.autopunditz.com/post/nitin-gadkari-outlines-the-huge-amount-of-fuel-that-india-will-save-due-to-mandatory-fastags
27https://www.tribuneindia.com/news/j-k/fastags-mandatory-at-toll-plazas-to-avail-benefits-nhai-27725

List of Abbreviations

Abbreviation	Definition
CAGR	Compounded Annual Growth Rate
COP	Conference of the Parties
DSRC	Dedicated Short-Range Communication
EMC	Ecosystem Management Coordination
EV	Electric Vehicle
ERP	Electronic Road Pricing
ETC	Electronic Toll Collection
GST	Goods and Services Tax
GDP	Gross Domestic Product
HGV	Heavy Goods Vehicle
IHMCL	Indian Highway Management Company Limited
ITM	Integrated Toll Module
MLFF	Multi-Lane Free Flow
NETC	National Electronic Toll Collection
NH	ssNational Highway
NHAI	National Highways Authority of India
NPCI	National Payments Corporation of India
OBU	On Board Unit
QR	Quick Response
TNG	Touch 'n Go
UPI	Unified Payments Interface

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