SESEI | Seconded European Standardisation Expert in India
Enabling Europe-India Cooperation on Standards

Seconded European Standardization Expert in India

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Study Report on

CIRCULAR ECONOMY (e-waste and Plastic waste)
SMART CITIES (Digital, Energy & Transportation)
DATA PRIVACY & CYBER SECURITY

DECEMBER 2023

FOREWORD

The SESEI project (Seconded European Standardization Expert in India) is a project co-funded by five European partners (EC, EFTA, CEN, CENLEC & ETSI), operating from New Delhi, India, with the objective to increase the visibility of European standardization in India and to promote EU/EFTA-India cooperation on standards and related activities.

The SESEI's mission is to enhance the visibility of European standardization activities, increase the cooperation between Indian and European standardization bodies and support European companies facing standardization related issues hampering market access to India

The project supports the cooperation between India and Europe in standardization related aspects, by identifying all potential opportunities for enhanced international cooperation and global harmonization of standards. Ultimately, the SESEI project aims at reducing the Technical Barriers to Trade (TBT) both between EU/EFTA and India and globally, thus supporting European and Indian industries by facilitating international trade.

SESEI project through its experts focuses mainly on the following priority topics, while also keeping a track and extending possible support to both EU/EFTA and India on the topics of WTO-TBT and Market Access, IPR, R&D and Innovation, National Manufacturing Policy: Make in India, EU-INDIA FTAs, etc.

- **Digitization: Strategic technologies, digital governance, and digital connectivity**:

  o Smart Cities/Urban Development, ITS, Quantum Technologies, Smart Grid/Meter, Artificial Intelligence, 5G/6G, Open RAN, M2M/IoT (Cyber-Physical Systems), DECT, Data Privacy, Satellite Communication, Blockchain, Digital Signature, Smart Manufacturing, e-Accessibility, cybersecurity, digital skills, digital platforms including Research and Innovation etc.

- **Green & Clean technologies**:

  o Clean Energy, Energy Efficiency (Green ICT), Environment, Circular Economy including Resource Efficiency, Waste Management, Energy storage technologies, Electric mobility, Green Hydrogen, Advanced biofuels including R&I etc.

This Study Report on "CIRCULAR ECONOMY (e-waste and plastic waste), SMART CITIES (Digital, Energy & Transport) & DATA PRIVACY AND CYBERSECURITY is commissioned to determine the sector profile, market dynamics, current state & future potential, gaps, challenges and key recommendations for India-EU/EFTA collaboration, covering standards development & policy initiatives in India and EU/EFTA to support the sectorial growth.

With this study report and through further deliberation on it at the "EU/EFTA India Conference on Standards & Emerging Technologies" scheduled for 7th December 2023 at The Lalit New Delhi, Project SESEI aims to determine list of actions as a way forward which shall further support Project SESEI in achieving its objective and strengthen the cooperation and collaboration between EU/EFTA and India.

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MAJOR TOPICS + THEIR COLOR CODES	Circular Economy	Connectivity in Smart Cities: Digital	Connectivity in Smart Cities: Energy	Connectivity in Smart Cities: Transport	Cybersecurity & Data Privacy
IMAGERY FOR BETTER READIBILITY					

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ACRONYMS

3GPP	3rd Generation Partnership Project
ADITYA	Atal Distribution Improvement Scheme
AFD	Agence Francaise de Development
AMI	Advanced Metering Infrastructures
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
APEC	Asia-Pacific Economic Cooperation
API	Application Programming Interface
ARPA	Advanced Research Project Agency-Energy
ASSOCHAM	Associated Chambers of Commerce and Industry of India
AWMINS	Architecture for Waste Management in Indian Smart Cities
BEE	Bureau of Energy Efficiency
BIS	Bureau of Indian Standards
BPR	Business Process Reengineering
BREEAM	Building Research Establishment Environmental Assessment Methodology
BRTS	Bus Rapid Transit System
BSES	Bharat Stage Emission standards
BSPS	Bus Signal Priority System
BYOD	Bring Your Own Device
CBG	Compressed biogas
CDAC	Centre for Development of Advanced Computing
CE	Circular Economy
CEA	Central Electricity Agency
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
cERT-In	Computer Emergency Response Team – India
CI	Critical Infrastructure
CII	Confederation of Indian Industry
CIP	Continuous Improvement Programs
CIPET	Central Institute of Petrochemical Engineering and Technology
CITIIS	City Investments to Innovate, Integrate, and Sustain
CIVITAS	Institute for Study of Civil Society Europe
CMPs	Consent Management Platforms
CO2	Carbon Dioxide
CoSMiC	Common SMart iot Connectiv
CPCB	Central Pollution Control Board
CRM	Critical Raw Materials
CSIR	Council of Scientific and Industrial Research
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen
DISCOMs	Distribution Companies
DoT	Department of Telecommunications
DPIA	Data Protection Impact Assessment
DRS	Deposit Return System
ECBC	Energy COnservation Building Code
EDM	European Data Market
EDPS	European Data Protection Supervisor
EEE	Electronic and Electrical equipment
EESL	Energy Efficiency Services Limited
EIB	European Investment Bank
eIC	Electronic Informed Consent
eID	European Digital Id
eIDAS	Electronic Identification, Authentication, and Trust Services

ACRONYMS

EIF4SCC	European Interoperability Framework for Smart Cities and
EIP-SCC	European Innovation Partnership on Smart Cities and Comm
EOL	End of Life
ENCS	European Network for Cyber Security
ENISA	European Union Agency for Cybersecurity
ENS project	Entry Summary Declaration.
EPA	Environment Protection Act
EPIC	European Platform for Intelligent Cities
EPR	Extended Producer Responsibility
ESIWA-ORF	Enhancing Security Cooperation In and With Asia
ESDM	Electronics System Design and Manufacturing
ERDF	European Regional Development Fund
ETNA	European Transport Network Alliance
ETS	Emission Trading System
EVs	Electric Vehicles
ETSI	European Telecommunications Standards Institute
ETSI ISG CIM	European Telecommunications Standards Institute Industry Specification Group on cross-cutting Context Information Management
FAME	Faster Adoption and Manufacturing of Electric Vehicles
FDI	Foreign Direct Investment
FICCI	Federation of Indian Chambers of Commerce and Industry
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation
GDPR	General Data Protection Regulation
GIS	Geographic Information Systems
GRIHA	Green Rating for Integrated Habitat Assessment
GST	Goods and Services Tax
HDPE	High Density Polyethylene
HERs	Home Energy Reports
HQE	Haute Qualité Environnementale or High Quality Environmental standard
IAPP	International Association of Privacy Professionals
ICCCs	Integrated Command and Control Centers
ICT	Information and Communication Technology
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IEC	International Electrotechnical Commission
IFCPAR	Indo-French Centre for Advanced Research
IGBC	Indian Green Building Council
IIT	Indian Institute of Technology
IMF	International Monetary Fund
INEA	Innovation and Networks Executive Agency
INSS	Indian National Strategy for Standardization
IoT	Internet of Things
IPDS	Integrated Power Distribution System
ISGF	India Smart Grid Forum
ISO	International Organization for Standardization
i-STEM	India- Science Technology Engineering and Mathematics
ITDP	Integrated Transport Depots
ITMS	Intelligent Traffic Management System
ITS	Intelligent Transport Systems
ITU	International Telecommunication Union
IUDX	India Urban Data Exchange
JTC 1	Joint Technical Committee
JWG	Joint Working Group

ACRONYMS

KfW	Kreditanstalt für Wiederaufbau
KYC	Know Your Customer
LEED	Leadership in Energy and Environmental Design
LIBs	Lithium Ion Batteries
LITD 28	Electronics and Information Technology Division
MaaS	Mobility-as-a-Service
MDMS	Master Data Management System
MeiTY	Ministry of Electronics and Information Technology
MoEFCC	Ministry of Environment Forest and Climate Change
MoRTH	Ministry of Road Transport and Highways
MoU	Memorandum Of Understanding
MSSP	Managed Security Service Provider
MSW	Municipal Solid Waste
NASSCOM	National Association of Software and Service Companies
NATRiP	National Automotive Testing and R&D Infrastructure Project
NCMC	National Common Mobility Card
NGSI-LD	Next Generation Service Interfaces-Linked Data
NIELIT	National Institute of Electronics & Information Technology
NIS	Network and information systems
NIUA	National Institute of Urban Affairs
NSGM	National Smart Grid Mission
ODAWS	Onboard Driver Assistance and Warning System
OMCs	Oil Marketing Companies
PAGE-R	Partnership to Advance Clean Energy Research
PAS	Publicly Available Spectification
PDP	Prevent-Detect-Protect
PIAs	Privacy Impact Assessments
PM UJALA	Pradhan Mantri- Unnat Jyoti by Affordable LEDs for All
PPP Model	Public-Private Partnership
PRO	Producer Responsibility Organization
ProSUM	Prospecting Secondary raw materials in the Urban mine and Mining waste
PVC	Poly Vinyl Chloride
RBI	Reserve Bank OF India
RED	Renewable Energy Directive
REMOURBAN	REgeneration MOdel for accelerating the smart URBAN transformation
RoHS	Restriction of Hazardous Substance
RPO	Renewable Purchase Obligation
S4AllCities	Smart Spaces Safety and Security for All Cities
SATAT	Sustainable Alternative Towards Affordable Transportation
SCM	Smart Cities Mission
SDG	Sustainable Development Goals
SDIC	Smart Data and Inclusive Cities
SET	Strategic Energy Technology
SNAP	Standards National Action Plan
SNLP	National Street Lighting Programme
SOC	Security Operations Center

ACRONYMS

SRM	Secondary Raw Materials
SUD	Sustainable Urban Development Strategies
SUP	Single Use Plastic
SWAMP	Sustainable Wetlands Adaptation and Mitigation Program
TCF	Transparency & Consent Framework
TEC	Telecommunication Engineering Centre
TEN-T	Trans European Transport Network
TSDSI	Telecommunications Standards Development Society, India
TSP	Telecom Service Providers
TTC	Trade and Technology Council
UDAY	Ujjwal DISCOMs Assurance Yojana
UDPs	Urban Data Platforms
ULBs	Urban Local Bodies
USG	United States Government
WEEE	Waste from Electronic and Electrical equipment
WFD	Water Framework Directive
WTO	World Trade Organization

BACKGROUND & OBJECTIVES

India remains the world's fastest-growing economy, per the IMF, with projected growth of 6.1% in 2023 and 6.8% in 2024, driven by domestic demand and government initiatives such as financial system development, forward-looking policies, infrastructure improvement, and relaxed FDI norms. India is also working on enhancing its trade, quality infrastructure, and standards through initiatives like the INSS, SNAP 2022, and updates to BIS ACT, Rules, and Conformity Assessment regulations.

India is concurrently transitioning towards digitalization and sustainability, emphasizing innovation and technology growth through initiatives like Smart Cities, which is dedicated to reducing the carbon footprint and fulfilling the SDGs commitments while addressing cybersecurity concerns with the "Digital Personal Data Protection Bill."

The 60-year-old EU/EFTA-India relationship spans socio-economic issues, multilateralism, rules-based order, and security cooperation. India and the EU/EFTA have developed frameworks for clean energy, climate cooperation, and connectivity, which are evolving under the Roadmap to 2025. These frameworks cover digital technologies, renewable energy, circular economy, and energy efficiency. The Trade and Technology Council (TTC) solidifies their strategic partnership, focusing on digital governance, clean energy, resilient value chains, trade, investment, and innovation for SDGs. Standards play a crucial role in these strategic technologies and sectors.
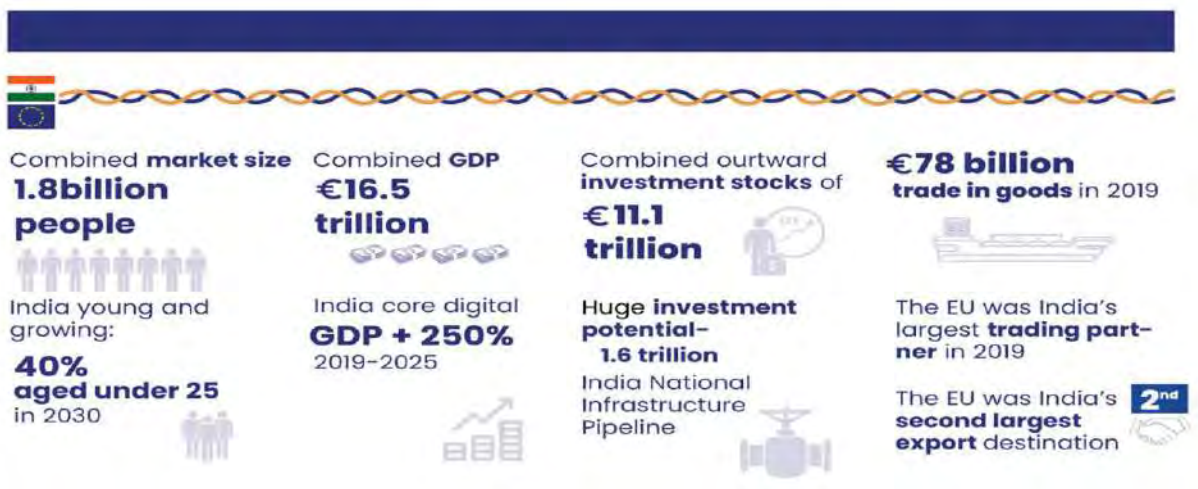
This report is meant to be a comprehensive overview, a prediction of the future, a deep analysis of upcoming digital, smart city, data privacy and cybersecurity concepts interlinked with India and EU/EFTA.

Sector Profile and Ecosystem

Developments and State of Play

EU/EFTA and India Cooperation
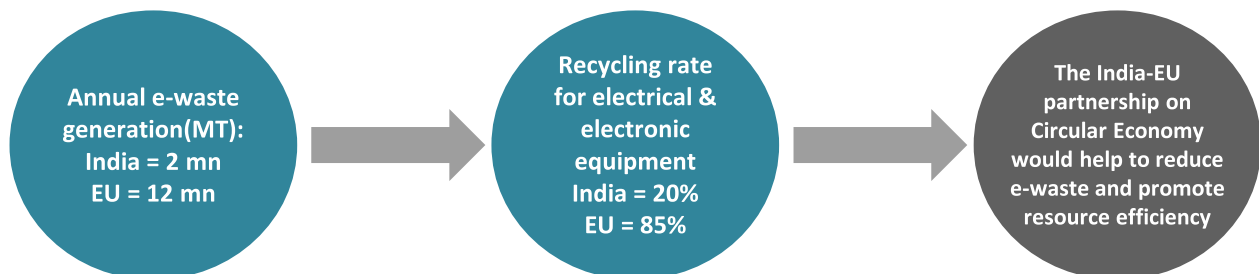
Gaps and Challenges

Recommendations & Way Forward

BACKGROUND & OBJECTIVES

Amidst growing global partnerships, the synergy between India and the European Union (EU/EFTA) emerges as a transformative force, shaping the digitalization, energy, security realms. As India's ascent to technological prominence aligns with the EU's pursuit , an opportunity for cross-continental synergy unfolds.

This report navigates the intricate dynamics within India-EU/EFTA collaboration in digital innovation, energy transition, Data Privacy and security. By exploring shared challenges, innovative solutions, and potential impacts, report reveal how this alliance redefines global narratives on technology, sustainability, and growth covering both Policy and Standards perspective. In a landscape transcending conventional boundaries, the India-EU/EFTA partnership spans across critical domains crucial to our shared future. This convergence of distinct trajectories tells a compelling story of innovation, sustainability, and security. Delving into pivotal themes, we illuminate the dimensions shaping this partnership's global impact.

Combined **market size**
1.8billion people

India young and growing:
40% aged under 25 in 2030

Combined **GDP**
€16.5 trillion

India core digital
GDP + 250% 2019-2025

Combined ourtward **investment stocks** of
€11.1 trillion

Huge investment potential– 1.6 trillion
India National Infrastructure Pipeline

€78 billion **trade in goods** in 2019

The EU was India's largest **trading partner** in 2019

The EU was India's **second largest export** destination **2nd**

Circular Economy (E-Waste & Plastics) : The concept of a circular economy, aimed at minimizing waste and maximizing resource utilization, unites India and the EU/EFTA. Amidst rising e-waste challenges propelled by the digital age, a shared vision has spurred collaborative efforts. Strategies to recycle, repurpose, and responsibly dispose of electronic devices drive environmental sustainability and economic growth. Additionally, India's initiatives against single-use plastics resonate with the EU's directives, showcasing joint action for a cleaner planet.

Annual e-waste generation(MT):
India = 2 mn
EU = 12 mn

➡️

Recycling rate for electrical & electronic equipment
India = 20%
EU = 85%

➡️

The India-EU partnership on Circular Economy would help to reduce e-waste and promote resource efficiency

BACKGROUND & OBJECTIVES

Digital Connectivity in Smart Cities: Connectivity & Efficient Smart Cities, where urbanization, technology, and energy efficiency converge, define India's vision. Aligning with the EU/EFTA's urban sustainability goals, both regions collaborate to create intelligent urban ecosystems. Shared expertise in energy-efficient infrastructure, intelligent transportation, and data-driven governance shapes cities prioritizing sustainability and quality of life.

- India has over 100 smart cities in development, and the EU/EFTA has over 100 smart cities.
- The India-EU/EFTA partnership on smart cities could help to share expertise and best practices on topics such as energy efficiency, intelligent transportation, and data-driven governance.
- The partnership could also help to promote the development of sustainable and resilient urban infrastructure.

Data Privacy & Cybersecurity: Digital Protection In the digital age, data privacy and cybersecurity stand paramount. India and the EU/EFTA recognize the imperative of safeguarding digital identities and sensitive information. Faced with similar challenges, they synergize efforts, fortifying the digital realm through shared expertise, policy exchange, and innovation. This unity underscores their commitment to secure digital spaces for citizens and businesses alike.

- India has a DPDP(Digital Personal Data Protection) Bill passed by government on 2023, and the EU/EFTA has the General Data Protection Regulation (GDPR).
- The India-EU//EFTA partnership on data privacy and cybersecurity could help to strengthen both countries' laws, regulations and Cyber Threats & protection.
- The partnership could also help to share expertise and best practices on topics such as implementation of DPDP Bill by India, incident response, risk management, and encryption.

EXECUTIVE SUMMARY

In the pursuit of fostering inclusive economies and societies through human-centric Digitalization and Green & Clean Technologies, India and the European Union (EU/EFTA) stand at the forefront of global standards advancement. United by common objectives, many collaborative initiatives span various sectors crucial for smart city development, circular economy and cybersecurity. This report encapsulates the key aspects of this collaborative journey, focusing on market dynamics, future potential, policy standardizations, and identified gaps and challenges.

Trade and Investment Potential:

- **Burgeoning Trade and Investment:** India is the world's fastest-growing large economy, with the EU/EFTA as its top trading partner in 2017, resulting in €86 billion in goods trade and €29 billion in services. There are untapped opportunities for further trade liberalization and expanded investment conditions that could unlock tremendous potential.
- **Investor Confidence:** The EU/EFTA is a significant investor in India, with over €72 billion in investments, while India is increasingly investing in the EU/EFTA, totaling €4.9 billion in 2016. Expanding these investments holds untapped potential for mutual benefits.
- **Employment Opportunities:** Over 6,000 EU/EFTA companies provide direct employment to 1.2 million Indians and indirect employment to 5 million. Realizing the full potential of job creation and fostering economic growth remains an untapped opportunity.

CIRCULAR ECONOMY

Being an emerging economy with a rapidly growing Gross Domestic Product (GDP), India is the third largest consumers of raw materials produced globally and estimated to consume nearly 15 billion tones of material by 2030 with the current economic trends. India's Electronic and Electrical Equipment (EEE) manufacturing is dependent on high material consumption with metals like Iron, copper, silver, gold, aluminum, manganese, chromium and zinc along with various rare earth elements. Rate of extraction of these abiotic resources for EEE manufacturing is significantly higher than the rate of their formation in nature. CE approach will thus be imperative to fulfil the resource needs for the country in this sector. EEE waste is considered as one of the rich sources of secondary raw materials and can contribute towards resource security and environmental sustainability.

EXECUTIVE SUMMARY

1.6 million ton e-waste and 3.5 million ton plastic per annum

Staggering 67% of e-waste remains completely unprocessed
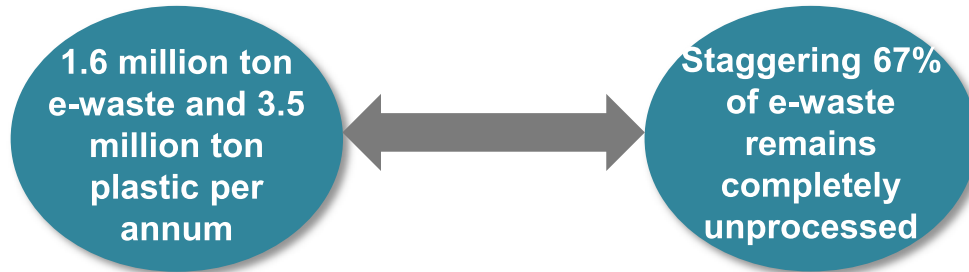
In 2021, the Indian EEE industry is forecasted to grow at a 16.6% CAGR to reach € 507.6 billion in 2025. Currently informal sector dominates the EOL management of e-waste in India, considering these numbers a lot of skilled labour would be required along with raw materials for such growth. Active presence of ULBs and private blended financial models can enable the formalization of some of the ragpickers in the sector.

EU/ EFTA

4.7 million e-waste and 3.5 million plastic per annum

Less than 40% of e-waste in EU is recycled

30 million ton plastic waste is generated per annum

As one of the developed regions of the world, CE is a development priority in EU/EFTA, which has been integrated in its industrial plan. While waste management scenario in EU/EFTA is at an advanced stage owing to lesser volumes and better infrastructure; e-waste is one of the fastest growing waste streams of the region. The EU/EFTA also ranks first in the world in terms of per capita e-waste generation accounting of 16.2 kg waste/head. Recycling practices are largely prevalent and vary among EU/EFTA countries with Croatia ranking at the top with 81% recycling of all electronic and electrical waste in 2017, while the number in Malta being only 21%.

Plastic waste, if not more but be given equal importance for application of circular economic principles. A staggering 4900 Mt of 6300 Mt of plastic ever produced has been lost from the functional value chain. Limited stock of petroleum resources, may also dry out plastic production in the future. Therefore, it is crucial that plastic alternatives are identified and used from right now. Unlike e-waste, plastic does not have a valuable material left at EOL to extract which make the take-make-waste model the most convenient and cost effective for plastic. Therefore, circular economy in the plastic sector should focus on 'slowing the material loop' to reduce demand and production.

India faces a significant challenge in managing plastic waste due to its large population and growing economy. The country will lose over € 125.02 billion of plastic material over the next decade in a BAU scenario. Some of the secondary applications of plastic waste in India are usage in road construction, waste-to-energy plants, waste-to-oil plants, and in cement plants for co-processing. However, these applications are largely limited in comparison to volume of waste generated.

The problem of mounting plastic is not seen as an issue of waste, but it is considered it as an issue of over production or poor production design in EU/EFTA. Europe claims to be one of the highest plastic recyclers in the world but still only 10% of all plastic in EU/EFTA is recycled. Over the years increased production of recycled plastic is seen in Europe but the graph is steeper in the increase in virgin plastic in European economy. With stricter regulations and imposition of an import ban in Asia in 2018, export of plastic waste in EU/EFTA has come down from 10% in 2010 to current 3% requiring EU/EFTA to manage its own waste by itself. Different countries of EU/EFTA differs in their generation of plastic waste with Belgium and Italy producing the highest amount of sorted plastic waste. It's unclear if their overall plastic consumption is high or household segregation of sorting out plastic as source is much regulated in these countries.

EXECUTIVE SUMMARY

There is much potential for incorporation of CE principles in the e-waste and plastic sector in India and EU/EFTA along different stages of the product value chain. EU/EFTA's **ProSUM project** is an exemplary urban mining knowledge center for the world to learn from to deal with e-waste. **CENELEC** has also established a set of comprehensive standards to cover major aspects of e-waste and plastic waste management in the EU/EFTA. Introduction of **Extended Producer Responsibility (EPR)** under the **E-waste and Plastic waste rules** has been a game changer for the Indian system of waste management as it has completely shifted the responsibility of waste to producers. Apart of the existing laws and standards in India, the Indian consumer culture has an ingrained tendency to reuse and recycle which is something EU/EFTA can learn and adopt. People in the EU/EFTA often have a penchant for high quality products which might create a mental block against products with secondary or recycled materials.

CONNECTIVITY IN SMART CITIES (DIGITAL, ENERGY, TRANSPORT)

As of 2022, the smart city market in India has been valued at €5.92 billion. Looking ahead, the anticipated compound annual growth rate (CAGR) from 2023 to 2031 is estimated at 25.2%. The ambitious target for 2031 is set at reaching a substantial valuation of €43.5 billion, reflecting India's dynamic trajectory in smart city initiatives.

On the other side, the European Union (EU/EFTA) is poised for robust growth in its smart city market. In 2023, the estimated market revenue is projected to hit €23.31 billion. The EU/EFTA anticipates a commendable annual growth rate with an expected CAGR of 12.42% from 2023 to 2028. By 2028, the smart cities market volume in the EU/EFTA is envisioned to reach an impressive €41.86 billion, underscoring the region's commitment to smart urban development.

The collaborative future potential is highlighted by initiatives such as the India-EU/EFTA Smart Grids Partnership, India-EU/EFTA Green Grids Initiative, and Smart Cities India-EU/EFTA Partnership. India's smart city market is projected to grow at an estimated CAGR of 25.2% from 2023 to 2031, while the EU/EFTA anticipates an annual growth rate (CAGR 2023-2028) of 12.42%.

Collaborative projects are reinforced by policy standardizations that align India's Smart Cities Mission, Swachh Bharat Abhiyan, and National Digital Communications Policy with the EU's Digital Agenda and Circular Economy Action Plan. Synergies in waste management, water, lighting, safety surveillance, and urban planning emerge from the integration of policies and initiatives. The EU/EFTA, under the European Green Deal, focuses on urban mobility solutions, interconnected rail networks, and autonomous vehicles.

Challenges such as high costs, low awareness, and incoherent national-level policies are identified in both regions. Collaborative efforts aim to address these challenges through knowledge exchange, joint research, policy dialogues, and capacity-building activities. The India-EU/EFTA collaboration encompasses initiatives such as the EU/EFTA-India Energy Dialogue, EU/EFTA-India Clean Energy and Climate Partnership, and the India-EU/EFTA Hydrogen Partnership.

India's projects, such as Swachh Bharat Abhiyan and Smart Meter Lighting, integrate seamlessly with EU/EFTA initiatives like Horizon 2020 Projects, creating synergies that transcend geographical boundaries. A strategic overview of these projects identifies shared goals and paves the way for effective collaboration. India and the EU/EFTA are already collaborating on smart waste management R&D, learning from each other's projects (Innovating Cities, SCIS, AWMINS, and Earthzy Technology Solutions), and jointly developing IoT-enabled waste management, AI, partnerships, segregation, recycling, and waste-to-energy projects.

In essence, the executive summary encapsulates the promise of a robust India-EU/EFTA collaboration, creating a blueprint for smart city development that transcends traditional boundaries. By integrating policies, leveraging project-specific synergies, and addressing challenges collectively, this collaborative journey envisions smarter, sustainable, and resilient cities for the future. The summarized insights, enriched with India-EU/EFTA stats, pave the way for a comprehensive understanding of the collaborative potential between India and the EU/EFTA in shaping the future of smart cities.

EXECUTIVE SUMMARY

In the realm of digital connectivity and smart city development, both India and the EU/EFTA have formulated comprehensive policies to harness the potential of emerging technologies. **India's Data Smart Cities Strategy (DSC)** initiated in 2015 aims to establish 100 Smart Cities with open data portals. **The Smart Cities Open Data Portal**, introduced in 2020, provides a collaborative platform for cities to share data, fostering a transparent and interconnected urban landscape. The **Data Maturity Assessment Framework (DMAF)** introduced in 2019 equips cities with a tool to evaluate their data maturity, ensuring a strategic approach to data management. The **City Data Policy (CDP)** and the **City Data Officer** (CDO) roles play a pivotal part in shaping and enforcing policies for effective city data management.

In the energy realm of smart cities, **National Smart Grid Mission** aims to modernize electricity grid through renewable incorporation, decentralization and ease of usage. The Bureau of Energy Efficiency (BEE)'s **Energy Conservation Building Code (ECBC)** is to ensure standardized features in buildings. India has also made rapid strides in smart city transportation; the **One Nation One Card** is an initiative for connected multimodal transportation in Indian cities. **Intelligent Traffic Management system (ITMS)** has been already put in place in several of India Tier 1 and Tier 2 cities.

On the other side of the globe, the EU and EFTA have introduced the **Living-in.EU movement** (2019), a city-led platform designed to accelerate digital transformation. The implementation of interoperable local data platforms is a key feature of the EU/EFTA's approach, promoting seamless data integration within and across city systems. Looking ahead, their **Data Space for Smart Communities initiative** (2022) aims to facilitate data sharing by creating a dedicated space for smart communities. Additionally, the introduction of **Local Digital Twins** (2022) emphasizes building the capacity of cities to implement these innovative digital frameworks, marking a strategic step towards more interconnected and digitally advanced urban landscapes. The **Strategic Energy Plan (SET)** and the **'Clean Energy for all'** is EU/EFTA's attempt to further smart grids and intelligent energy management in the European economy. The **'Renewable Energy Directive'** has set a target of 42.% renewable energy integration in the European grid by 2030.

The EU/EFTA has also made significant strides is creating **state-of-art transportation** in their countries. Introduction of seamless multi modal transportation, dynamic pricing models, real-time traffic management, rapid expansion of charging infrastructure of e-mobility are some of the initiatives. The parallel efforts of India and the EU/EFTA signify a shared commitment to leveraging smart connectivity for the holistic development of smart cities.

India, in its pursuit of smart urban development, has launched key initiatives and policies to address pressing challenges and enhance city living. The AWMINS (IoT Enabled Smart Waste Bin Management System) project stands out, deploying smart bins with sensors for efficient waste management. Additionally, the ambitious **Smart Meter National Programme**, led by Energy Efficiency Services Ltd. (EESL), aims to retrofit 250 million conventional meters with smart variants, promoting energy efficiency and digitalization. The **SAAR initiative** (Smart Cities and Academia Towards Action & Research) and the **AMRUT Mission** focus on efficient water management systems and water treatment plant development, aligning with the broader Smart City Mission. Furthermore, the comprehensive **Smart Cities Surveillance and Safety Market** underscores the commitment to using technology for public safety, evident in the emphasis on intelligent surveillance solutions and robust safety and surveillance policies.

On the other hand, the European Union (EU) and European Free Trade Association (EFTA) have been at the forefront of innovation in smart urban development. The **SCALS (Smart Cities Adaptive Lighting System)** project exemplifies the EU's commitment to adaptive urban smart lighting, enabling municipalities to manage and control public street lighting lamps efficiently. In the realm of waste management, the **SLUDGE 4.0** project, supported by ROP funding, showcases innovative approaches to solid waste collection and processing. The EU/EFTA's commitment to climate-neutral urban development is reflected in the **Innovating Cities initiative**, aiming to transform 100 cities by 2030. Notable projects include **mySmartlife**, focusing on innovative urban planning, and the **Artificial Intelligence in Smart Cities & Urban Mobility** project, exploring AI applications for urban development. Thales Group's **Security Digital Platform**, utilizing big data, AI, and cybersecurity, represents a significant stride in enhancing safety and security infrastructure.

EXECUTIVE SUMMARY

The EU/EFTA could collaborate with India's **Smart Meter Rollout** and smart city initiatives, while India can collaborate with the EU's cutting-edge projects like **SCALS** and **mySmartlife**. Joint efforts in deploying smart LED lighting, implementing **Advanced Metering Infrastructure (AMI)** and **Outage Management System (OMS)**, and developing AI applications for smart cities are pivotal for mutual growth and sustainability. Emphasizing collaboration in R&D projects, learning from each other's successes, and collectively contributing to the advancement of smart urban development underscore the potential of the India-EU/EFTA partnership.

In the rapidly evolving landscape of urban development, the collaboration between India and the European Union (EU) in building digital connectivity for smart cities is pivotal. The initiation of the Internet of Things (IoT) Policy in India, with its five vertical pillars and overarching supports, lays the foundation for comprehensive digital integration.

India has undertaken significant initiatives to propel its smart city development agenda, notably through the **CITIIS 2.0 project**. This initiative, managed by the **National Project Management Unit (PMU)** at the National Institute of Urban Affairs (NIUA), focuses on providing on-site guidance, capacity building, and peer-to-peer learning for effective implementation. The National Urban Learning Portal (NULP) further augments India's commitment to creating a knowledge-sharing platform for city managers and stakeholders, fostering innovation in data-driven urban planning.

On the other hand, the EU/EFTA stands at the forefront of innovative urban planning, as evident in initiatives like the **Innovating Cities initiative**. Aimed at *transforming 100 cities* to climate neutrality by 2030, this initiative explores AI applications in smart cities, shaping sustainable urban development. Thales Group, a key player, enhances city efficiency through integrated transport, safety, and security infrastructure, employing a Security Digital Platform with big data, AI, and cybersecurity. The Smart Cities Adaptive Lighting System (SCALS) showcases the EU/EFTA's commitment to adaptive urban smart lighting. Collaborations with India include initiatives such as creating a platform for sharing best practices, experiences, and technologies, contributing to the global evolution of smarter and more sustainable cities.

Recommendations include establishing collaborative networks at regional levels, appointing officers for urban data, and forming a **Data Analytics and Management Unit** (DAM Unit) to ensure the effective implementation of the **DataSmart Cities** strategy. The collaborative efforts between India and the EU/EFTA signify a transformative journey toward sustainable and technologically advanced smart cities.

EXECUTIVE SUMMARY

The collaboration between the European Union (EU/EFTA) and India has evolved into a comprehensive partnership, particularly in the Information and Communication Technology (ICT) sector. Key initiatives, including the **EU/EFTA-India ICT Dialogue, India-EU/EFTA Joint ICT Working Group**, **Project SESEI** have been pivotal in fostering dialogues on digital connectivity, information technologies, and pertinent policy matters. These engagements reflect a longstanding commitment to exploring innovative approaches and shared solutions in the realm of smart cities.

- **Joint Working Groups on Urbanization:** The collaboration extends to urbanization, with the formation of the India-EU/EFTA Joint Working Groups on Urbanization. Stemming from a joint declaration in 2017, these groups emphasize sustainable urban development and smart cities, underlining the significance of technology exchange and collaboration. The working groups serve as platforms for sharing best practices, focusing on sustainable urban planning, governance, and technology-driven smart city solutions.

- **Trade and Technology Council (Brussels, May 2023):** In the recent Trade and Technology Council, India and EU/EFTA established three working groups, with one dedicated to Strategic Technologies, Digital Governance, and Digital Connectivity. This working group concentrates on crucial aspects such as digital connectivity, AI, 5G and 6G, quantum computing, semiconductors, cloud systems, cybersecurity, digital skills, and digital platforms. These collaborative endeavors showcase a commitment to advancing digital connectivity, shaping the future of technology, and fostering innovation in both regions. Project SESEI presence in India will help strengthening this cooperation in Standards & Policy as the engagement continues and evolve further.

- **BIS, TSDSI & TEC Standards Development:** The Bureau of Indian Standards (BIS) and the Telecommunications Standards Development Society (TSDSI), Telecommunication Engineering Centre (TEC) under Department of Telecom etc, are playing an instrumental roles in setting standards for M2M/IoT and Smart Infrastructure. These organizations maintain dedicated working groups focused on formulating standards, contributing to the harmonization of global standards and promoting compatibility, interoperability, scale, and affordability in the digital landscape. With the presence of Project SESEI in India, these Indian organization are working closely with its EU/EFTA partners such as CEN-CENELEC-ETSI along with European Commission (EC) and European Free Trade Association (EFTA)

The report concludes with forward-looking recommendations, emphasizing collaborative research and development in smart waste management, water, meter lighting, public safety surveillance, and urban planning. Specific projects like India-EU/EFTA Smart Grids Partnership, India-EU/EFTA Green Grids Initiative, and Smart Cities India-EU/EFTA Partnership highlight the potential for impactful collaboration. The Startup Europe India Network (SEINET) continues to advise on scaling up tech firms and issues related to venture capital, impact innovation, and investment sourcing in European and Indian markets.

EXECUTIVE SUMMARY

<u>DATA PRIVACY AND CYBERSECURITY</u>

The cybersecurity market in India is poised for expansion, driven by increased mobile device usage, secure authentication practices, and shifts in antivirus software. The Indian government's prioritization of cybersecurity, formation of task teams, and collaboration with the USG underscore the commitment to secure digital landscapes. However, the absence of comprehensive data protection legislation in India emphasizes the need for user empowerment and personal data rights. India's strategic approach aligns with the goal of achieving a €0.94 trillion digital economy by 2025.

India can tap into the EU's cybersecurity expertise to refine national policies and attract investments, especially from the EU/EFTA. Collaboration is envisioned in shaping new frameworks for eIDAS and digital ID wallets. Cross-border data transfer agreements and a common data protection certification scheme are in the pipeline, promising enhanced cybersecurity and privacy standards through joint efforts.

Some of the important **Policies and their Standardization Initiatives** include:

India: Personal Data Protection Bill (2023): Regulates digital personal data processing; **Digital India Initiative (2023):** Covers cybercrime, data protection, and online safety; **National Digital Health Mission (2020):** Connects patients and practitioners digitally; **National Cyber Security Strategy (2020):** Ensures a safe cyberspace; **Reserve Bank Of India (2018):** Equalizes security frameworks for banks; **Data Localization Initiative (2018):** Proposes data localization measures; **Cyber Swachhta Kendra (2017):** A platform for cleaning computers of viruses; **National Cyber Security Policy (2013):** Facilitates secure computing environment.

EU/EFTA: ENISA (2023): Develops cybersecurity certification schemes; **ENCS (2023):** Shares knowledge between security officers; **Cyber Solidarity Act (2023):** Improves response to cybersecurity incidents; **Cyber Resilience Act (2022):** Establishes cybersecurity requirements; **NIS2 (2020):** Protects critical organizations from cyber threats; **Cyber Security Act (2019):** Improves protection against cybersecurity threats.

Cooperation Opportunity includes:

- **Data Encryption Standards:** Collaboration on standardization through international organizations (ISO, IEC); Enhances data security, reduces costs, and promotes interoperability.
- **Secure Authentication Frameworks:** Collaborative development of secure authentication standards; Joint education, outreach campaigns, and government regulations.
- **Data Breach Response Plans:** Identification of best practices for data breach response; Common tools and resources for standardized response strategies.
- **Privacy Impact Assessments (PIAs):** Adoption of international standards (ISO/IEC 29134); Joint project for a common PIA template.
- **Consent Management Frameworks:** Joint initiatives involving experts, technical standards, research, and innovation.
- **Identity Protection Protocol:** Pilot projects to test and demonstrate identity protection protocols.

The collaboration between India and the EU/EFTA presents opportunities and challenges. There is a need for collaborative insights on GDPR and DPDB, emphasizing a shared understanding of data protection laws. Focus should be placed on establishing common data encryption standards, necessitating joint efforts to ensure a robust cybersecurity framework etc. Joint frameworks for encryption and certification are essential, requiring alignment to bolster security measures. The prioritization of collaboration for secure authentication mandates a collective approach to strengthen cybersecurity practices. Both parties must work on shared data breach response standards to streamline compliance with laws in both regions. The development of a customized Privacy Impact Assessment (PIA) and collaboration on consent management frameworks are critical steps. Joint initiatives for identity protection protocols are imperative to establish unified standards. The mutual recognition of data protection standards for cross-border data transfers is a shared challenge and opportunity for both India and the EU/EFTA.

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India is at the forefront of groundbreaking research and development in identity verification, showcasing significant strides in various domains. Initiatives such as robust SIM card seller ID verification, the New DigiLocker program, and advancements in KYC facilitated by the RBI Innovation Hub highlight the nation's commitment to secure and streamlined identity verification processes. The Aadhaar ecosystem has seen enhancements, complemented by initiatives like e-KYC infrastructure and projects such as NPR and APAAR, contributing to a comprehensive and secure identity verification landscape. In the realm of cybersecurity, India has made noteworthy efforts, particularly in the development of e-governance infrastructure, UPI integration, blockchain authentication, and extensive awareness campaigns to bolster digital security.

The European Union (EU/EFTA) underscores its commitment to secure digital identity solutions through strategic frameworks and initiatives. The eIDAS Regulation establishes a robust framework for electronic identification and authentication, emphasizing security, interoperability, and reliability. The MyData framework, EBSI, European Digital Identity Wallet, and the Self-Sovereign Identity (SSI) initiative via the ESSIF project collectively reflect the EU's dedication to fostering secure and user-centric digital identity solutions. In the realm of cybersecurity, the EU/EFTA adopts a proactive stance, as evidenced by the NIS 2 directive, which outlines essential cybersecurity measures. The EU/EFTA also implements consent management frameworks, formulates comprehensive data breach response plans, and adheres to stringent cross-border data transfer standards, reinforcing its commitment to safeguarding digital assets and privacy.

India, recognizing the transformative impact of digital technology, has strategically positioned itself to address emerging cybersecurity challenges. The Cybersecurity Opportunity Initiative Framework serves as a comprehensive strategy, integrating policies, human capital development, research, innovation, technology, clusters, and financing. In a forward-looking approach, the nation emphasizes governance and Continuous Improvement Programs to counter evolving cyber threats. The ongoing susceptibility to cyber threats, despite significant investments, underscores the need for continual vigilance. Collaborative efforts between India and the EU/EFTA aim to pool expertise, share best practices, and collectively address shared challenges, enhancing overall cybersecurity.

The EU/EFTA, amidst rapid digital adoption, employs the Cybersecurity Opportunity Initiative Framework, acknowledging the multi-faceted nature of cybersecurity challenges. With a focus on governance and continuous improvement, the EU/EFTA seeks adaptive strategies to counter emerging threats. The discussion on digital adoption's impact on organizational revenue highlights the increasing reliance on digital platforms. Persistent cyber threats, including ransomware and supply chain attacks, necessitate adaptive security measures. Recognizing the critical role of governments in cybersecurity governance, the EU/EFTA advocates for public awareness and cross-border collaboration with India, fostering a cyber-resilient society.

The APEC Cybersecurity Working Group fosters cooperation among APEC member economies, concentrating on incident response, supply chain security, and critical infrastructure protection. The Cybersecurity Capacity Building Initiative (CCBI), a joint effort involving the United States, Japan, Australia, and India, assists in building cybersecurity capabilities in developing countries within the Indo-Pacific region.

In India, to address the scarcity of cybersecurity experts, innovative recruitment and training strategies are essential, requiring collaborative efforts in Indian bodies from the Ministry of Communications (MoC), Ministry of Electronics and Information Technology (MeiTY), Ministry of Education (MoE), and the private sector to establish a comprehensive framework for cybersecurity capacity building. On the other hand, in the EU/EFTA, the Data Governance Regulation (DGR), adopted in 2022, establishes a robust framework for data governance and protection, aiming to promote responsible data processing practices and enhance user control over personal data.

- The EU/EFTA-India Cyber Dialogue (2015) fosters cooperation in data protection, cybercrime prevention, and critical infrastructure. The EU/EFTA-India Joint Working Group supports these efforts through joint exercises, training programs, and information sharing.

- The EU/EFTA-India Joint Declaration (2020) promotes a shared vision on data protection, cybersecurity standards, and a trusted digital ecosystem. The EU/EFTA-India ICT Standardization Collaboration (2020) with Indian stakeholders including Project SESEI aligns data privacy and cybersecurity standards.

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- The Budapest Convention on Cybercrime (2001) establishes a legal framework for international cooperation.

- The EU/EFTA-India Trade and Technology Council (2022) is a platform for discussions on trade, technology, cybersecurity, data privacy, and the digital economy. Key policies include Privacy and Data Protection Considerations in Bilateral Agreements (2021) and Capacity Building and Technical Cooperation in Cybersecurity (2020).

- The EU/EFTA-India Cyber-Cooperation Centers initiative (2018) and The India-EU/EFTA Joint ICT Working Group align with the EU's vision for a resilient digital future. The India-EU/EFTA Joint ICT Working Group covers AI, digital platforms, data governance, cybersecurity, and networks. The India-EU/EFTA Cyber Dialogue explores internet governance, UN cyber diplomacy, regional cooperation, capacity-building, and emerging cyber technologies.

India's cybersecurity training landscape is robust with initiatives such as BSNL's nationwide training centers and MTNL's profitable ICT-related services. Noteworthy contributions from C-DOT align with national missions, emphasizing self-reliance. Mission Karmayogi, launched in 2020, focuses on creating future-ready civil servants. The NICF's Capacity Building & Skill Development Program underscores telecom sector skill enhancement. TCIL's women empowerment initiatives highlight diversity in skill development.

Mentioned below are several government-led initiatives, platforms, and legislative measures serve as drivers for fostering collaboration between India and the EU/EFTA in the domains of Circular Economy, Smart City Connectivity (Digital, Energy, Transport), and cybersecurity. These strategic efforts lay the groundwork for a robust partnership, paving the way for mutual growth and innovation in key sectors.

- NASSCOM serves as a pivotal platform for fostering collaboration between Indian and EU/EFTA smart cities. The key areas of focus include Knowledge Exchange, where best practices are shared between the two regions, and Norm Coordination to discuss open, secure internet norms, reducing reliance on global tech. Digital Resilience initiatives aim to enhance the digital economy, promote innovation, and foster research and partnerships. The Tech Innovation Showcase encourages innovation projects and demonstrations, while Capacity Building offers training programs and research initiatives. Business Partnerships are facilitated to encourage collaboration between Indian IT-ITeS companies and EU/EFTA tech firms. Additionally, NASSCOM's Thought Leadership involves organizing events to explore the latest smart city trends, contributing to dynamic collaboration and sustainable growth.

- ASSOCHAM has been proactive in addressing the growing concerns in the digital space. Recognizing the importance of secure financial transactions and operational infrastructure, ASSOCHAM has been advocating for robust cybersecurity measures, especially around digital payments. ASSOCHAM and Ernst & Young have collaborated on preparing a joint report on Digital Financial security that highlights the existing legislations in India, types of frauds, key challenges around fraud detection, enforcement, investigation, and risk management in the online payment industry. This initiative underscores ASSOCHAM's commitment to fostering a secure digital environment in India.

- BIS (Bureau of Indian Standards) plays a crucial role in promoting standardized digital connectivity for seamless cross-border smart cities. The organization is actively involved in Guideline Development, creating guidelines covering IoT, data privacy, cybersecurity, and communication protocols. Harmonizing Standards with EU/EFTA ensures streamlined technology interoperability. Collaborative Workshops and Research Initiatives are encouraged to address smart city standardization gaps through Project SESEI etc. The establishment of Joint Technical Committees is vital for collective standards development, and Certification Programs ensure quality infrastructure with compliance certification, including secure IoT devices.

- TTC (Trade and Technology Council) serves as a Collaboration Hub, providing a platform for Indian renewable energy companies to partner with EU/EFTA counterparts. Shared Goals identify mutual interests in sustainable urban development, focusing on projects like waste optimization with IoT and data analytics. Knowledge Exchange involves hosting webinars where Indian startups in energy-efficient construction share insights with European urban planners. TTC actively facilitates Partnership, fostering collaboration between Indian and EU/EFTA companies in electric vehicle infrastructure and expanding charging networks for EV adoption. Policy Alignment ensures harmonization of data privacy regulations for seamless cross-border data sharing in smart city projects.

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- The Government of India through its Telecommunication Engineering Centre (TEC) has adopted TSDSI's transposed oneM2M and 3GPP standards as national standards for IoT/M2M technologies, marking significant milestones for standards-based solutions across various industries. TSDSI, India's Telecom SDO, organized a workshop addressing IoT/M2M use cases in Fintech and Smart Cities, recommending strategies for technology pilots and field trials. TSDSI's contribution to standardization in BIS ensures a unified, secure, and sustainable digital infrastructure in smart cities, aligning with the goal of driving digital communication standards for enhanced competitiveness in global ICT markets.

- The ISO/IEC 30145-3 standard, part of the Smart City ICT reference framework developed by ISO and IEC, establishes a layered ICT structure for streamlined smart city operations. Collaboratively, ISO, IEC, and ITU have formed a Smart Cities Task Force to address evolving standardization needs, ensuring global cities benefit from an interoperable framework. Another key contribution, ISO 37101, provides a comprehensive framework empowering cities to define "smart" objectives and strategies for sustainable development, guiding them in aligning goals with principles of sustainability.

- In India, CII has partnered with Tata Communications for the CII-Tata Communications Centre for Digital Transformation, which aims to drive the adoption of mobile, cloud, IoT, and cybersecurity. Additionally, CII, along with Deloitte Touche Tohmatsu India LLP, launched a comprehensive report highlighting 5G technology as a key enabler for the success of enterprise business.

- FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community. FICCI, being the voice of India's business and industry, influences policy, encourages debate, and engages with policy makers and civil society to articulate the views and concerns of the industry, thereby playing a significant role in shaping these economic ties. The Urban Infrastructure & Smart Cities Committee has been set up by merging the FICCI Urban Infrastructure Committee and FICCI Task Force on Smart Cities. The committee comprises industry members from different areas such as urban infrastructure, information & communication technology, geospatial technologies, energy, homeland security, housing, manufacturing, infrastructure and academia.

- The Joint Technical Committee 1 (JTC1) is a joint technical committee of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) that is responsible for developing and maintaining international standards for information technology (IT). JTC1 plays a vital role in cybersecurity standardization in India by developing and promoting international standards, contributing to national standards development, providing training and education, and participating in international initiatives. This work helps to protect India's critical infrastructure, businesses, and citizens from cyber threats.

- The National Quality Control Laboratory (NCL) plays a crucial role in India's cybersecurity landscape, actively contributing to the formulation of standards, conducting testing and evaluation, certifying products and services, promoting awareness, and contributing to research and development. NCL's efforts have significantly elevated cybersecurity practices in India, fostering digital resilience across sectors.

- CERT-IN (Computer Emergency Response Team - India) serves as a Cybersecurity Authority, mandated with obligations outlined in a 2022 directive. With a G-20 Focus during India's 2023 presidency, CERT-IN aims to enhance global digital cooperation. Collaboration with QUAD partners focuses on aligning privacy laws and data flow frameworks. Mutual Cybersecurity efforts between India and the EU/EFTA aim to share insights for stronger cybersecurity and data privacy. CERT-IN is actively involved in tracking Data Localization Progress and conducting Data Transfer Assessments, emphasizing a Data Privacy Emphasis in line with evolving global standards.

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- CERT-EU plays a pivotal role in shaping a cohesive cybersecurity landscape across European Union (EU/EFTA) member states by spearheading the development of standardized frameworks. The organization takes the lead in crafting common guidelines for risk assessment, incident response, and security controls, fostering collaboration and consistency among EU/EFTA nations. By prioritizing the strengthening of information exchange among EU/EFTA institutions, CERT-EU enhances incident response capabilities, ensuring more precise and effective assessments. Notably, CERT-EU serves as a facilitator in India-EU collaborations, leveraging its expertise to address cybersecurity challenges and promote best practices. Through its proactive approach, CERT-EU contributes to establishing a global-standard cybersecurity environment, laying the foundation for robust and collaborative efforts between India and the EU/EFTA.

- India's potential accession to Budapest Convention for Cybercrime offers a pathway to align its cybersecurity initiatives with global norms, fostering enhanced international collaboration in addressing cyber threats and cybercrime. This alignment not only bolsters India's cybersecurity preparedness but also contributes to elevating global standards and practices, promoting a more secure and interconnected digital landscape. Engaging diverse stakeholders, including the private sector, civil society, and research institutions, is crucial for shaping robust cybersecurity strategies. In this regard, the Budapest Convention for Cybercrime stands as a significant avenue for international cooperation and the harmonization of cybersecurity efforts.

- India's Digital Personal Data Protection (DPDP) Act is a groundbreaking regulation overseeing digital personal data processing. It introduces "Consent Managers" to streamline data management, providing individuals with greater control. The DPDP Act outlines exemptions, emphasizing government entities' roles, and proposes a robust encryption mandate for data security. Balancing privacy and innovation, the legislation promotes data portability and economic growth. The establishment of a Data Protection Authority (DPA) shall ensure compliance oversight. The DPDP Act address's identity verification, proposing a comprehensive framework aligned with international standards. It emphasizes secure authentication and considers collaboration with the EU/EFTA on electronic-IDs. Harmonization with GDPR for cross-border data transfers highlights India's commitment to global data protection standards. The Act aligns with the EU's focus on responsible data practices, including open science initiatives and data anonymization. This reflects a shared dedication to ensuring secure and responsible data processing.

Few following are opportunities between EU/EFTA – INDIA to strengthen further around Standards, Policies and Research on the topic of priority and mutual interest:

Climate Partnership:

- *Clean Energy Commitment:* The EU/EFTA and India established a Clean Energy and Climate Partnership in 2016, focusing on renewable energy, energy efficiency, and smart grids. There are untapped opportunities for increased collaboration in Standards, Policy, research, technology transfer, and large-scale deployment of clean energy solutions.

- *Promoting Renewable Energy:* The partnership supports initiatives like India's off-shore wind plant and the Solar Parks Programme, highlighting untapped potential in fostering sustainable energy initiatives.

- *Green Investments:* The EU/EFTA promotes green investments and blending financing for sustainable urban housing and mobility, offering untapped opportunities for catalyzing green investments in urban development.

Renewable Energy Transition:

- *Transition to Renewable Energy:* Both India and the EU/EFTA have ambitious renewable energy goals. Sharing knowledge, technologies, and financing solutions can accelerate the transition to a low-carbon, sustainable energy future.

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Smart Cities and Digital Connectivity:

- *Investment Opportunities:* India offers significant opportunities for technology-sharing and know-how exchange, with EU/EFTA companies excelling in sectors like infrastructure, transport, telecoms, and basic industry. Exploring these untapped opportunities can strengthen sustainable modernization.

- *EIB's Contribution:* The European Investment Bank (EIB) is investing €2.5 billion in infrastructure, renewable energy, and climate projects in India. There are untapped areas where this investment can further drive sustainability and innovation.

Data Privacy and Innovation:

- *Commitment to Innovation:* Both India and the EU/EFTA share a commitment to the role of innovation in economic development and job creation. Exploring untapped opportunities for collaborative research and innovation projects can address global challenges.

- *Data Protection Reforms:* India's robust start-up ecosystem aligns with the EU's promotion of networking between innovators, start-ups, and incubators, presenting untapped potential for cross-border innovation and entrepreneurship.

- *Data Protection Cooperation:* Convergence in data protection systems could ease data flows between the EU/EFTA and India, promoting an adequacy dialogue on data protection standards, unlocking untapped opportunities for seamless data exchange.

Multilateral Cooperation:

- *Rules-Based Global Order:* EU/EFTA and India share a commitment to a rules-based global order, collaborating at international forums like the UN, G20, and WTO. Leveraging this commitment, there are untapped opportunities for jointly developing effective multilateral solutions to global challenges, fostering international security and economic stability.

Infrastructure Development:

- *Smart Infrastructure Initiatives:* Collaborating on smart infrastructure projects in transportation, energy, and healthcare can unlock untapped opportunities for modernization and improved urban living.

CIRCULAR
ECONOMY

Circular Economy (CE) is an industrial system that is restorative or regenerative by intention and design. In contrast to the existing model of linear economy, which is highly extractive and resource-intensive, CE aims to maximize the value and lifespan of resources, products, and materials.. Within this progressive framework of CE principles, the plastic and e-waste sectors emerge as focal points, demanding immediate attention to mitigate their environmental impacts.

Plastic has always been one of the most sought-after sectors where application of circular economic principles were considered crucial, owing to the negative environmental impact of large volumes of plastic on all our natural ecosystems. In more recent times, ever since the 3rd industrial revolution, digitalization has revolutionized the experience of human life but at the same time a new problem of mounting e-waste came to light which was probably unanticipated in foresight. In simple language, e-waste refers to any electronic product that gets thrown away after its functional life is over. E-waste has a huge negative impact on the global environment.

The chapter embarks on a comprehensive exploration of the circular economy principles as they apply to the dynamic landscapes of plastic waste and e-waste in both India and the European Union (EU/EFTA). The journey traverses market dynamics, existing policies, standardizations, and the intricate tapestry of challenges and gaps that shape the circular economy landscape in these regions.

The chapter dissects the sector profiles of plastic waste and e-waste in India and the EU/EFTA, shedding light on the complexities of resource management and sustainable practices. Our lens focuses on understanding market dynamics, assessing the effectiveness of existing policies, unraveling standardization efforts, and confronting the nuanced challenges that both regions grapple with on their circular economy trajectory.

With the onset of digital India in the country's burgeoning economy, it has been heavily reliant on Electronic and Electrical Equipment (EEE) usage. Also, its struggle with plastic waste amid rapid economic growth has been unraveled the intricacies. Meanwhile, in the EU/EFTA, a developed region with a robust circular economy integrated into its industrial plan, the chapter delves into the advanced waste management landscape, tackling the escalating challenge of e-waste and the nuances of plastic waste production and consumption.
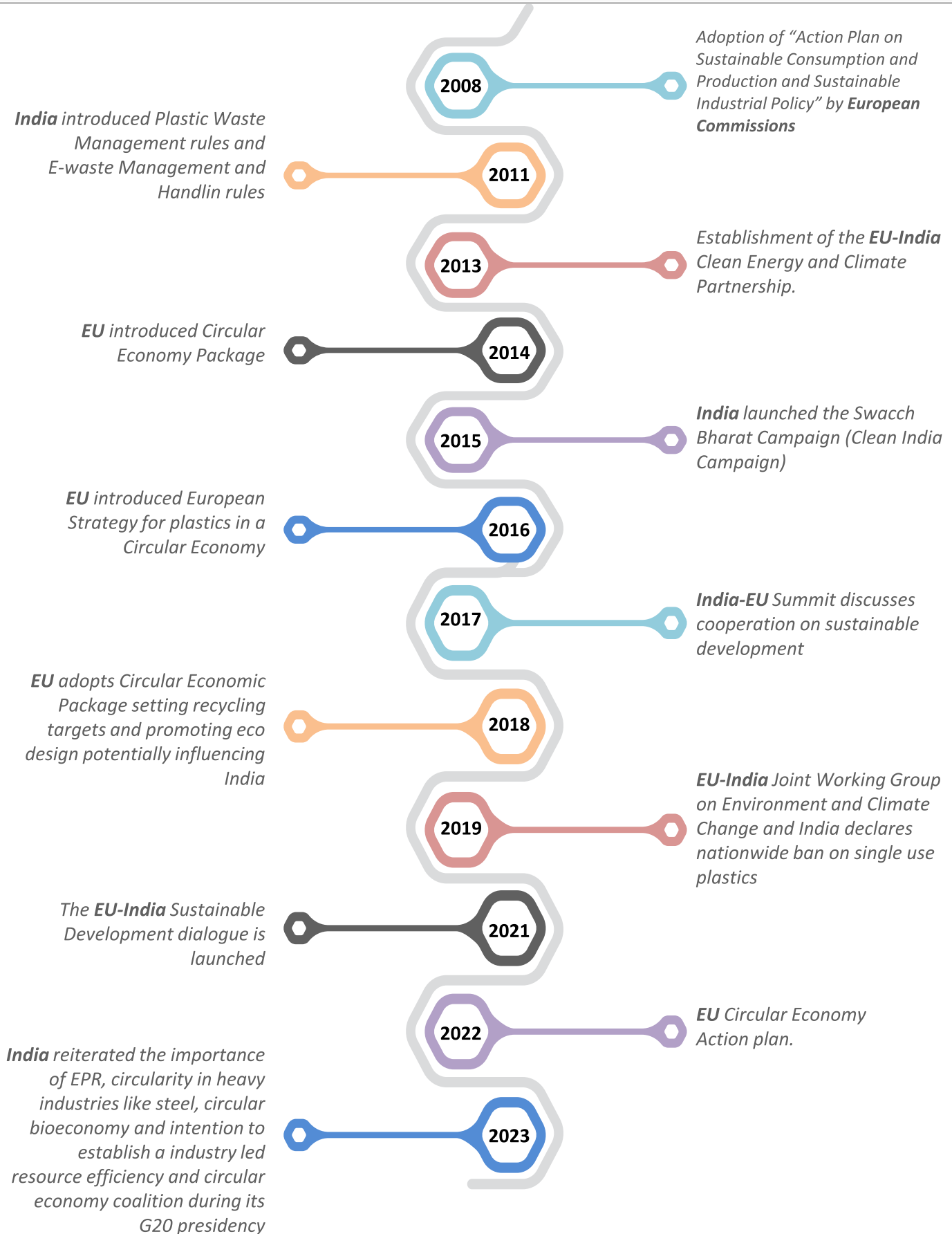
The exploration extends beyond mere observation. The chapter scrutinizes the gaps, challenges, and opportunities embedded in the current circular economy practices of both India and the EU/EFTA. The chapter serves as a roadmap, guiding readers through the intricate landscape of circularity, offering insights into how these regions are poised to address the pressing environmental concerns posed by plastic and e-waste.

Circular Eco

2008 — Adoption of "Action Plan on Sustainable Consumption and Production and Sustainable Industrial Policy" by **European Commissions**

India introduced Plastic Waste Management rules and E-waste Management and Handlin rules — **2011**

2013 — Establishment of the **EU-India** Clean Energy and Climate Partnership.

EU introduced Circular Economy Package — **2014**

2015 — *India* launched the Swacch Bharat Campaign (Clean India Campaign)

EU introduced European Strategy for plastics in a Circular Economy — **2016**

2017 — *India-EU* Summit discusses cooperation on sustainable development

EU adopts Circular Economic Package setting recycling targets and promoting eco design potentially influencing India — **2018**

2019 — *EU-India* Joint Working Group on Environment and Climate Change and India declares nationwide ban on single use plastics

The **EU-India** Sustainable Development dialogue is launched — **2021**

2022 — *EU* Circular Economy Action plan.

India reiterated the importance of EPR, circularity in heavy industries like steel, circular bioeconomy and intention to establish a industry led resource efficiency and circular economy coalition during its G20 presidency — **2023**

E-WASTE	PLASTIC WASTE

E-WASTE

- Unavailability of complex and varied raw materials like critical minerals and rare earths due to higher costs or inaccessibility has the potential to disrupt EEE production processes like manufacture of solar panels, electric vehicles, and many defense equipment; which can cause chaos in economic systems and value-chains across the world; and affect livelihoods.

- Urban mining from e-waste provides that opportunity to producers for ensuring access to materials at a far lower cost and on a continuous basis.

- FICCI's Circular Economy report, 2017, outlined that the business opportunity for extracting gold from e-waste is to the tune of € 641- 912 billion per annum.

- The Electronics System Design & Manufacturing (ESDM) Industry Report, 2021 forecasts a 16.6% CAGR, projecting the industry in India to grow from €201.1 billion (FY19) to €507.6 billion (FY25). With increased security of resources domestically, it is anticipated that greater production will follow leading to provision of skilled jobs in the sector.

- Furthermore, to ensure robust value chains, CE skilled professionals and experts would be needed.

- It must be noted that the currently informal sector in India is the backbone of recycling and resource recovery. Owing to lack of economic capital and access to technology, the ways and means employed are often archaic in nature leading to low yield of resource recovered and creation of waste. With the culture and mandate of urban mining from e-waste, there is likely to grow increased connection between recyclers/Producer Responsibility Organizations (PROs) and informal rag pickers *(kabadiwalas)*. ULBs and private other blended financial models may enable increased formalization of current rag pickers through capacity building and training.

PLASTIC WASTE

- A staggering 4900 Mt of 6300 Mt of total plastics ever produced has been lost from the functional value chain and is lying in landfills or oceans or are burnt. Oil and gas is taken from the earth to make plastic products, that are often designed to be used only once, and then thrown away. This is what is called a linear **take-make-waste** model.

- With limited stock of petroleum resources and the rapid transition to greener energy resources, it is wise to seek alternate sources of plastic production as well as substitute plastic with other functional materials. Circular economy solutions will help in 'closing the material loop' to minimize waste and to keep materials out of landfills, incinerators and the ocean but the circular economy will not completely solve the global plastic problem.

- Unlike e-waste, plastic don't have extractable material at EOL. An all-encompassing solution should seek to 'slow the material loop', that is to reduce demand and produce only essential plastic products, including through discouraging non-essential production and use of plastics, and promoting the use of renewable and recyclable alternatives to plastics.

- India is assumed to lose over €125.02 billion of plastic material value over the coming next 10 years until 2030 owing to unsustainable packaging out of which almost 75% of the value, or €94 billion, can be retrieved.

- FICCI's Circular Economy report highlighted a multi billion-dollar industry can be built if recycling of plastics is actively pursued. In addition to monetary gains, a flourishing urban mining industry can facilitate collaboration between PROs, formal recyclers, and informal waste pickers. Blended financial models, supported by Urban Local Bodies (ULBs) and private sectors, can enable the formalization of the informal sector thereby securing their livelihoods.

E -WASTE SECTOR			
Application Based	**India**	**EU/EFTA**	**Future Potential**
RAW MATERIAL ACQUISITION	• No major mineral discovery in India for 40 years. • Lack of exploration, especially in technology metals. • Crucial for manufacturing modern devices and energy efficiency.	• EU/EFTA's ProSUM project: 1st urban mine knowledge database for e-waste. Aims to improve EU's raw material supply position. • After 3 years, project offers recommendations for raw material acquisition in Europe.	• Promoting SRM adoption, incentivizing reduced mining dependence. • Creating national material sampling labs. • Mandating source disclosure and SRM usage targets for manufacturers. • Boosting R&D and SRM extraction infrastructure. • Focusing on CRM content, waste management, stock quantification, and quality alignment.
PRODUCT DESIGN	• Rapid tech advancement in technology	• Advancements in recycling tech, but still behind • E-waste complexity grows • Recycling new products with existing recycling technology • Design often neglects EOL • Developed countries influence design	• Circular Industry Guidelines Inspired by EU/EFTA Eco-Design Principles: • Enforce eco-design principles for industry circularity. • Implement compliance incentives and penalties. • Set standards to prevent planned obsolescence. • Build a skilled workforce through capacity development. • Extend product lifespan, streamline remanufacturing and recycling, and reduce material use for resource sustainability.
CONSUMPTION	• 74% in 2020 Global Scan Survey aim to reduce environmental footprint. • Gap between aspiration and actual behavior. • Difficulty making sustainable choices in an unsupportive system. • Accessibility and affordability of eco-friendly products crucial for change.	• EU/EFTA consumption: savings-based economy. • Higher per capita electronics consumption. • EU/EFTA e-products have 2.3 years shorter lifespan than intended. • Driven by rapid tech advances and factors like quality deterioration and market pressures.	• Implement CE labeling for consumer information; Promote circular consumption awareness programs. • Set refurbishment, reparability, and spare parts guidelines; Encourage consumer-driven manufacturing and design. • Provide product lease and rental options. • Adopt green public procurement practices. • Establish e-waste Deposit-Return Systems (DRSs). • Expand the packaging Deposit-Return System to cover e-waste. • Create a secondary electronic products market with buy-back schemes and clear guidelines.
COLLECTION/ DISMANTLING/ RECYCLING	• India's e-waste issue worsened by illegal recycling by *kabadiwalas* and *raddiwalas*.(informal waste pickers) • These informal workers operate independently, evading regulation. • Recyclers often use harmful methods, releasing toxic pollutants.	• EU/EFTA WEEE Directive: Ensures safe electronic waste handling. • Manufacturers and distributors are responsible for disposal. • Consumers can return equipment for free. • Producers must collect specific e-waste categories.	• Raise consumer e-waste disposal awareness. • Introduce e-waste DRS/Buyback schemes with clear guidelines. • Strengthen capacity of recyclers, PROs, dismantlers, and kabadiwalas. • Create digital infrastructure for e-waste collection and monitoring. • Nationwide operation through MoEFCC's empaneled digital infrastructure. • Enforce recycling standards and recovery targets to prevent material leakage to informal sector; Include dismantled and destroyed products in the collection system. • EU can pioneer mechanized e-waste disposal system development.
POST EOL/SECONDARY USE OF MATERIALS	• The custom of hand-me-downs is practiced in India even for electronic equipments • Thriving second-hand market for used electronic goods slows the resource loop. • Large e-waste generators who often lacks regulations auction e-waste as scrap. • No large scaling tracking of EEE consumption. • No accountability for entities involved in End-of-Life (EOL) practices.	• EU/EFTA focus: CRM recovery, Volume reduction of scrappage • EU/EFTA goal: Proper disposal of scrappage	• EU/EFTA: Design policies for secondary product applications and prevent rapid obsolescence. • Establish individual/household reuse and remanufacturing targets for e-waste.

PLASTIC SECTOR			
Application Based	**India**	**EU/EFTA**	**Future Potential**
RAW MATERIAL ACQUISITION	• India relies on virgin plastic production to meet demand. • High plastic recycling rate in India, but EOL polymers often downcycled instead of forming a closed loop.	• EU/EFTA excels in plastic recycling tech. • Lower plastic management volume. • Growing use of secondary plastic in manufacturing. • Recycled plastic market penetration still low.	• Invest in recycling infrastructure and polymer-specific R&D. • Introduce tax incentives favoring recycled plastic products. • Establish quality standards for recycled plastic. • Promote a shift in manufacturer mindset towards recycled plastic use.
PRODUCT DESIGN	• India embracing circular plastic design but faces awareness and infrastructure challenges. • Ban on SUPs lacks strong implementation.	• Plastics use various polymers and customized additives. • Customization complicates recycling and raises costs. • Quality and value of recycled plastic affect product design	• Standardize SUP definitions, ban low-end street vendors. • Track suppliers, inspect, penalize rule-breakers. • Promote reusable and plastic-free options. • Enforce plastic reduction laws. • Opt for recyclable mono-layer packaging. • Focus on recyclable plastic packaging.
CONSUMPTION	• Plastic suits India's price-sensitive market. • An affordable alternative is needed to reduce low-grade plastic use in India.	• EU/EFTA consumption is more extravagant than India • High per capita plastic consumption in EU/EFTA	• Promote usage of traditional Indian materials like husk, paper, leaves etc. to replace plastic • Prioritize bio-based alternatives. • Disclose plastic usage in institutions. • Regular audits and voluntary reduction of usage • Encourage aluminum packaging. • Set individual consumption goals. • Introduce plastic credits.
COLLECTION / DISMANTLING/RECYCLING	• India's informal sector vital for waste collection, handling most plastic but lacking tech for quality.	• EU/EFTA's reduced plastic waste exports • Exporting waste reduces availability of secondary raw materials • Rising demand exacerbates the problem	• Sort at source for better municipal recycling. • DRS cuts plastic waste and enhances collection. • Fast-track R&D for polymer-specific tech. • Further TRANSFORM-CE project of EU for innovative plastic recycling.
POST EOL / SECONDARY USE OF MATERIALS	• Custom of hands down in Indian consumer culture • Indian households use single-use plastic products like PET bottles and carry bags repeatedly, affecting the resource loop • Circular economy (CE) requires more than secondary usage for plastic products	• High per capita plastic consumption in EU/EFTA. • Urgent need to reduce plastic production and introduce competitive alternatives.	• Low-value end-of-life (EOL) plastic products in need of substitution and reduced production. • In EU the focus should be on increasing the product lifetime and recycling plastic waste rather than only on disposal, incineration, and exporting.

E- WASTE SECTOR IN INDIA

- The 2011 E-Waste Rules aimed to regulate electronic waste management under the Environmental Protection Act of 1986.
- In 2016, the rules were amended to emphasize circularity and introduced features like PRO, DRS, and EPR.
- MoEFCC's Battery Waste Management Rules, 2022 application to all battery types in to enhance CE principles.
- These rules apply to 21 products and involve various stakeholders but not informal sectors.
- The EPR system with financial penalties improved waste collection but informal sector dominance remains a challenge.
- In 2018-19, India had 312 recycling facilities, which increased to 407 in 2019-20.
- Collectors, dismantlers, and recyclers must obtain e-waste authorization from SPCBs.
- i-STEM initiative of the office of the Principal Scientific Adviser to PMO to support India's electronic and electrical equipment R&D.
- **Bureau of Indian Standards (BIS)**, established in 1986, has created standards for the e-waste sector in India, covering safety, guidelines, recycling, PV modules, and lead acid batteries, among others. BIS has developed standards for certain types of wastes. These standards are developed by few of following Technical Committees (TCs):
  - o **CHD 33:** These standards are on specifications, terminology, methods of sampling and characterization of solid waste (excluding Bio- Medical & Nuclear Waste). They also include codes of practices on reduction, recycling, reuse and treatment of solid wastes (excluding Bio-Medical & Nuclear Waste) and the guidelines and codes of practice for solid waste disposal (Excluding Bio-Medical & Nuclear Waste).
  - o *IS 17862: 2022:* Storage Collection Dismantling and Recycling of E-waste
  - o **ETD 43:** Standardization of Environmental Aspects for Electrical and Electronic Products: ETD 43 is responsible for developing the necessary guidelines, basic standards, in the environmental area, in close cooperation with product committees, which remain autonomous in dealing with the environmental aspects relevant to their products. The aim is also to liaise with product committees for environmental requirements of product standards in order to foster common technical approaches and solutions for similar problems and thus assure consistency in standards.
  - o IS 16584: 2017 IEC/TR 62635: 2012 Guidelines for End-of-Life Information Provided by Manufacturers and
  - o Recyclers and for Recyclable and for Recyclability Rate Calculation of Electrical and Electronic Equipment, IS 16279 : 2018/IEC/PAS 62545 : 2008: Environmental Information on Electrical and Electronic Equipment (EIEEE), IS 17340 : 2021/IEC 62542 : 2013: Environmental standardization for electrical and electronic Products and systems Glossary of terms, IS 17996 : 2022/IEC 63000: Technical Documentation for the Assessment of Electrical and Electronic Products with respect to the Restriction of Hazardous Substances

E- WASTE SECTOR IN EU/EFTA

- By 2027, portable batteries in appliances should be user-replaceable. The EU/EFTA's WEEE regulations (Directive 2012/19/EU) aim to promote sustainability in electronics by reducing environmental and health risks from improper e-waste disposal, conserving resources, and encouraging sustainable practices. Key aspects include collection, recycling, and recovery, Extended Producer Responsibility, stringent treatment and recycling standards, and data security.
- The EU's RoHS Directive limits hazardous substances in electronic equipment to minimize environmental and health risks. CENELEC sets European standards for electronic and electrical products, covering safety, electromagnetic compatibility, energy management systems, medical equipment, signaling systems, and more. Some of the relevant standards pertaining to e-waste in the EU/EFTA region are:
  - o **EN 50581:** standard specifies the methodology for collection & evaluation of technical information necessary for conformity assessment according to the law. It involves adherence to specific requirements for the restriction of certain hazardous substances including lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE). Compliance with RoHS is generally assessed by manufacturers and importers, and it may involve testing, documentation, and certification processes.
  - o **EN 50625:** Collection, logistics & treatment requirements for WEEE (Waste Electrical and Electronic Equipment):
  - o Covers various aspects of e-waste management, including the collection, logistics, and treatment requirements for waste electrical and electronic equipment.
  - o **EN 50614:** General Methodology for Assessment of Environmental Performance of Energy-Related Products: This standard provides a general methodology for assessing environmental performance of energy-related products, also including electronic devices.
  - o **EN 50574:** Marking of electrical & electronic equipment in accordance with Article 11(2) of Directive 2012/19/EU (WEEE):This standard addresses the marking of electrical & electronic equipment in compliance with Article 11(2) of WEEE Directive.
  - o **EN 50419:** Technical documentation for assessment of electrical & electronic products with respect to restriction of hazardous substances

PLASTIC SECTOR IN INDIA

- The 2011 **Plastic Waste Management Rules**, created under the Environment (Protection) Act (EPA) of 1986, aimed to regulate plastic waste management. In 2016, amendments were introduced, emphasizing the significance of the 3Rs: Reduce, Reuse, and Recycle, highlighting the focus on circularity in the plastic sector.

- **Extended Producer Responsibility (EPR)** for plastic products, introduced in the amended rules, makes plastic producers accountable for their products' entire lifecycle. This encourages them to design more recyclable products and supports the creation of recycling facilities. The rules also require plastic waste generators to minimize waste, avoid littering, segregate waste at the source, and hand it over according to regulations. Local bodies, gram panchayats, waste generators, retailers, and street vendors are also responsible for managing plastic waste. The Plastic Waste Management Amendment Rules of 2021 provide legal backing for the effective implementation of EPR rules.

- The **2019 Single Use Plastic (SUP) Waste Management** Rules were introduced to tackle single-use plastic challenges by promoting eco-friendly alternatives and reducing their use.

- India is actively promoting plastic circularity to **reduce pollution and support recycling**. The country requires all plastic manufacturing and recycling units to register with relevant pollution control authorities. Despite having 4953 registered units, unregistered ones are frequently found, with 823 recently identified. The government mandates labeling on plastic bags and multi-layered packaging, which 14 States/UTs have followed. Non-compliance led to 25 States/UTs imposing fines, issuing notices, and seizing banned plastic material.

Timeline of policies in the Plastic Waste sector of India

- Indian Prime Minister has called for the phase-out of single-use plastics by 2022 due to their harmful effects on the environment. The rules target the ban of disposable plastic items that are commonly littered and have limited utility.

- In 2019, at the 4th United Nations Environment Assembly, India took the initiative to address pollution from single-use plastics. They increased the thickness of plastic bags from 50 to 75 microns and later to 120 microns starting from December 31, 2022, to reduce littering. Simultaneously, the government launched awareness campaigns to educate consumers about the elimination of single-use plastics. To encourage innovation in finding alternatives to single-use plastics and digital solutions for plastic waste management, India organized the India Plastic Challenge - Hackathon 2021 for students from Higher Educational Institutions and startups under the Startup India Initiative.

- The Bureau of India Standards (BIS) has developed some standards for recycled products including plastics. The **BIS** has established standards for plastic production, quality, and recycling, encompassing various aspects. These standards cover specific polymers, such as rigid PVC pipes (IS 4985), polyethylene for food packaging (IS 10146), HDPE pipes for drinking water (IS 10910), polypropylene (IS 14531), unplasticized PVC for agriculture (IS 10141), and the use of biodegradable plastics in mulching and packaging (IS 15801 and IS 16647). These standards aim to safeguard economic value chains by preventing the introduction of undesirable polymers.

- **Petroleum Coal & Related Product Division Council (PCD) TC 12:** Indian Standards for specifications for thermosetting and thermoplastic resins-bonded and molding materials; natural and synthetic polymers, synthetic resin bonded laminates thermoplastic films and sheets, plasticizers cellular plastics, finished plastic articles, composites and reinforced plastics (excluding sanitary wares and plastic pipes for water supply and plastic packaging containers) safety of toys, and natural and synthetic adhesives (excluding for plywood industry and electrical tapes).
  - *IS 14534: 2023:* Plastics guidelines for the recovery and recycling of plastics waste.
  - *IS 14535: 1998:* Recycled plastics for the manufacturing of products – Designation.

PLASTIC SECTOR IN EU/EFTA

- The **EU/EFTA Plastics Strategy of 2018** laid the groundwork for a more circular and resource-efficient plastic economy. It highlighted the importance of reducing plastic waste and promoting recycling and reuse.

- In 2019, the EU/EFTA adopted the Single-Use Plastics Directive, targeting the 10 most common single-use plastic products found on European beaches, including fishing gear. Currently, the directive bans the production of disposable plastic cutlery, crockery, straws, stirring sticks, cotton buds, balloon wands, to-go beverage cups, fast food packaging, and polystyrene food containers in the EU/EFTA. This directive's goal is to significantly reduce the environmental impact of these plastics by implementing extended producer responsibility schemes, making manufacturers responsible for end-of-life management, especially for fishing gear.

- **The EU's Circular Economy** Package introduced higher plastic recycling targets: 55% by 2030 and 65% by 2035. It also promotes eco-design and the use of recycled plastics in new products.

- The EU/EFTA aims to reduce Municipal Solid Waste (MSW) landfilling to under 10% by 2035, following its Landfilling directive (1999/31/EC).

- **EU's CEN TC 249 ON Plastic** is responsible for Standardization of terminology, test methods, specifications, classifications and designation systems, environmental aspects, joining systems and techniques of plastics, plastic-based materials, semi-finished products and products (thermoplastics, thermosets, degradable plastics, bio-based polymers, thermoplastic elastomers, composites, reinforcement products for plastics, recyclates). Rubber is excluded. Specific end-product related items are also excluded if they are covered by the scope of an existing product. It also aligns with ISO standards for plastics, covering aspects such as tensile properties (ISO 527), plastic density (ISO 1183), disintegration (ISO 16232), burning behavior (ISO 1860), and thermal properties (ISO 20753 and 22007). HDPE pipes for drinking water (IS 10910), polypropylene (IS 14531), unplasticized PVC for agriculture (IS 10141), and the use of biodegradable plastics in mulching and packaging (IS 15801 and IS 16647) are also included. These standards aim to safeguard economic value chains by preventing the introduction of undesirable polymers.
- CEN/TR 15353:2007: Plastics - Recycled plastics - Guidelines for the development of standards for recycled plastics
- CEN/TS 16010:2020: Plastics - Recycled plastics - Sampling procedures for testing plastics waste and recyclates
- EN 15343:2007: Plastics - Recycled Plastics - Plastics recycling traceability and assessment of conformity and recycled content
- EN 15347:2007: Plastics - Recycled Plastics - Characterisation of plastics wastes

GAPS,CHALLENGES & RECOMMENDATIONS

Circular Eco

GAPS & RECOMMENDATIONS: E-WASTE		
INDIA	**EU/EFTA**	**INDIA-EU/EFTA**
• India generates about 1.5 lakh tonnes of e-waste annually, and almost all of it finds its way into the informal sector as there is no organized alternative available at present. • Leakages of the collected waste to informal recycling facilities due to various reasons and therefore a significant quantity of the generated e-waste is still being processed by informal sector. Auction of e-waste by the bulk consumers needs to be strictly monitored to check the existing infrastructure of the bidding agencies which is an important reason for leakages • Informal recycling is done without proper safety equipment and training which exposes workers to hazardous materials such as lead, mercury, and cadmium. A portion of these substances also leaches into the environment. Need is for a "reverse supply chain" involving the collection of devices, wiping personal data, and further processing and recycling. • Creation of an effective auditable database of materials collected through this process and forming geographical clusters for device disassembly is required. • Develop standards across the e-waste value chain using agencies like BEE, BIS, CPCB, and MoEFCC. Learn through collaborations from initiates from other parts of the world examples like WEEE Labex, CENELEC, E-stewards, R2 standards.	• The EU/EFTA's significant reliance on imports exposes a vulnerability, necessitating a transition towards a circular economy to mitigate dependence and alleviate environmental pressures. • Recycling of lithium-ion batteries (LIBs), a substantial component of e-waste, remains a challenging and evolving domain, presenting a notable impediment to achieving circularity. • There is disparity in eco-investment benefits across EU member states. The need is for a concerted, inclusive effort towards achieving high capacities of e-waste recycling. • Remove constrains of costs and the fragmentation of EU/EFTA's e-waste management market with digital solution uptake by waste operators and producer responsibility organizations (PROs). • Collaborative efforts between EU/EFTA and other nations through shared platform to share best practices and learn from each other	**INFORMATION BASED** • Voluntary Environmental Agreements with industry leaders for life cycle environmental benefits • Information flow among stakeholders across value chain stages • Raising awareness and providing product environmental information **MARKET BASED** • Recognition and benchmarking: Identify and promote eco-friendly products through policy-driven transparency. • Manufacturer efforts: Mandate manufacturers to promote circular economy in advertising. • Green product procurement: Large organizations and governments can drive social and environmental benefits. • Incentivization: Offer rebates and tax reductions for using recycled materials. • Inclusion in Green Credits program: Enable the trading of green credits for e-waste collection. **REGULATORY** • Categorization of e-waste based on toxicity and resource efficiency potential. • Calculation of EPR targets and product weight: Use Compulsory Registration scheme to prevent misreporting. • Expand stakeholders and assign responsibilities in CE framework. • Implement digital system for EPR monitoring and information sharing. • Establish a dedicated EPR budget and enforcement fund. • Graded penalties: Enforce low, medium, and high-grade penalties for non-compliance. • EU/EFTA example: Various countries have civil fines and criminal charges for non-compliance. Spain uses local compliance organizations.

GAPS,CHALLENGES & RECOMMENDATIONS

GAPS & RECOMMENDATIONS: PLASTIC		
INDIA	**EU/EFTA**	**INDIA-EU/EFTA**
• India is a price sensitive market and preference is towards availability of low-cost goods in the market rather than high quality expensive products. This demand feeds well into the current practice of informal downcycling of collected products into low quality daily items. Formal recycled lose out on significant raw materials in the process. • The transition towards a circular plastics economy necessitates significant investments in infrastructure and technology, along with robust policy frameworks that incentivize sustainability. • Collaboration between public and private sectors, as well as the integration of informal waste sectors, remains difficult but is vital in achieving meaningful progress towards a circular economy.	• High consumer culture and penchant for high quality products among European consumers creates mental block against secondary plastic products. Additionally, low prices of virgin plastics make them economically more attractive for manufacturers, discouraging the use of recycled plastics. • Need is for consumer awareness and a shift in behaviour change. • Volatility in Recycling Markets: Fluctuations in oil prices and global demand affect the prices of recycled plastics, creating uncertainty for recycling businesses.	**INFORMATION BASED:** • Public awareness to promote more and more waste segregation. • Environmental messaging: GoI's Ecomark scheme. • Start young: Teach kids 4Rs under UNESCO's program. **MARKET BASED** • Learn and adopt best practices from others: E.g.: 50% tax reduction in Sweden for repair services on household items rather than purchase of new ones. • Higher taxation to discourage SUP and multilayer plastic use. • Plastic EOL management in Green Credits program. **REGULATORY** • Mandate recycled plastics in non-food sectors • Regulate plastic content based on product size. • Replace mixed polymer usage to mono-polymer. • Promote plastic substitutes in packaging. • Address plastic degradation with virgin plastic additives. • Ban Single use plastics and multi-layer polymers.

CONNECTIVITY IN SMART CITIES

DIGITAL | ENERGY | TRANSPORT

A smart city is a technologically modern urban area that uses different types of electronic methods and sensors to collect specific data. Information gained from that data is used to manage assets, resources and services efficiently; in return, that data is used to improve operations across the city.
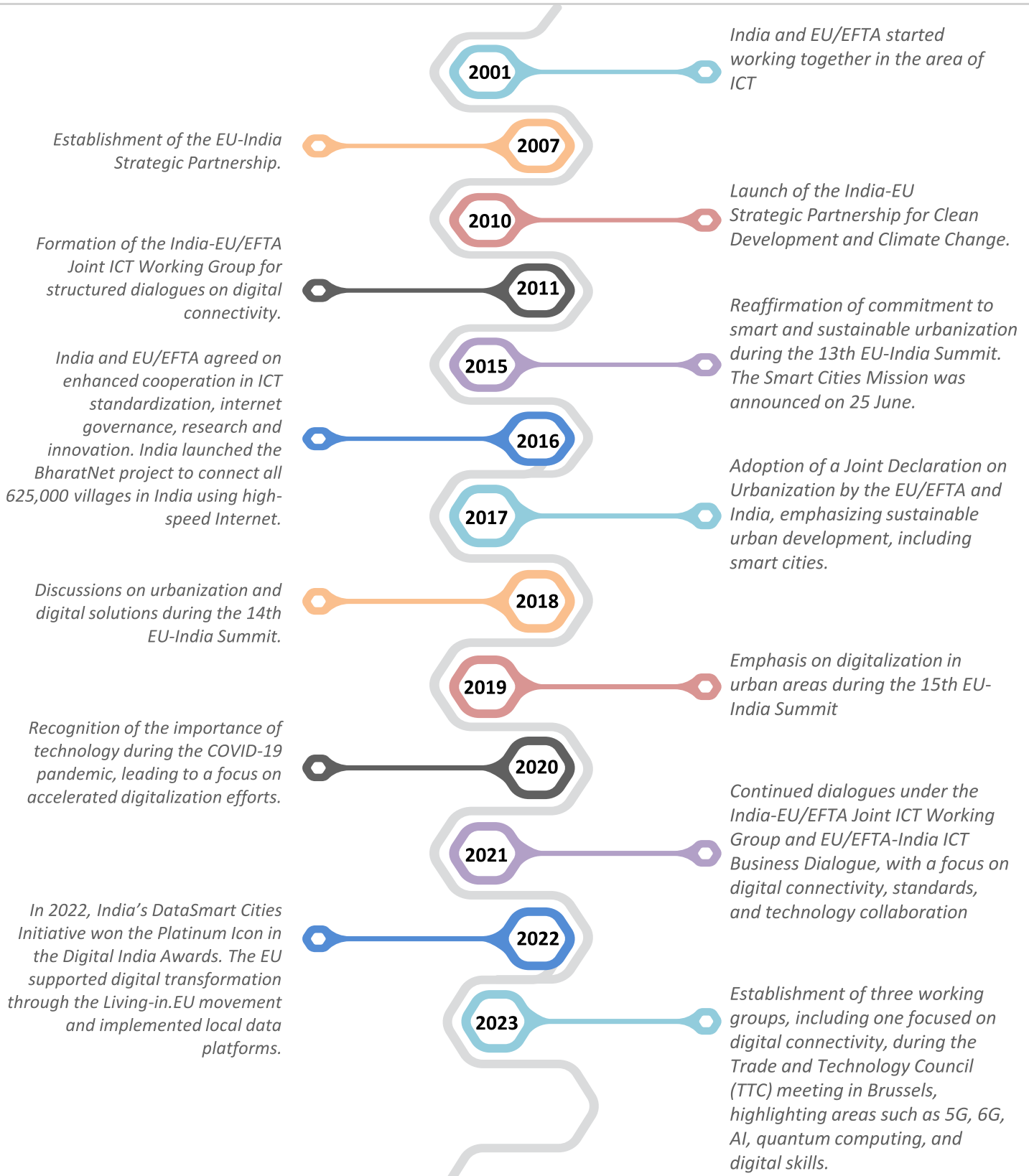
In the era of rapid urbanization, this concept of Smart Cities has emerged as a transformative force, reshaping the urban landscape through innovative technologies and digital integration. The chapter delves into the dynamic realm of Smart Cities, encapsulating the profound influence of the digital revolution on urban development. As the digital revolution unfolds, it catalyzes unprecedented advancements in the energy, transportation, and overall infrastructure sectors. Exploring the sector profiles of Smart Cities in both India and the European Union (EU/EFTA), this chapter navigates through the intricate market dynamics of these sub-sectors. It scrutinizes the policies and standards governing Smart Cities, elucidating the distinctive approaches embraced by India and the EU/EFTA in fostering urban intelligence. Amidst the progress, the narrative does not shy away from unraveling the gaps and challenges that underscore the journey toward smart urbanization. This comprehensive exploration seeks to provide a holistic understanding of the intricate tapestry of Smart Cities, bridging the technological advancements with the socio-economic and policy landscapes of India and the EU/EFTA.

SECTOR PROFILE : TIMELINES

2001 — India and EU/EFTA started working together in the area of ICT

2007 — Establishment of the EU-India Strategic Partnership.

2010 — Launch of the India-EU Strategic Partnership for Clean Development and Climate Change.

2011 — Formation of the India-EU/EFTA Joint ICT Working Group for structured dialogues on digital connectivity.

2015 — Reaffirmation of commitment to smart and sustainable urbanization during the 13th EU-India Summit. The Smart Cities Mission was announced on 25 June.

2016 — India and EU/EFTA agreed on enhanced cooperation in ICT standardization, internet governance, research and innovation. India launched the BharatNet project to connect all 625,000 villages in India using high-speed Internet.

2017 — Adoption of a Joint Declaration on Urbanization by the EU/EFTA and India, emphasizing sustainable urban development, including smart cities.

2018 — Discussions on urbanization and digital solutions during the 14th EU-India Summit.

2019 — Emphasis on digitalization in urban areas during the 15th EU-India Summit

2020 — Recognition of the importance of technology during the COVID-19 pandemic, leading to a focus on accelerated digitalization efforts.

2021 — Continued dialogues under the India-EU/EFTA Joint ICT Working Group and EU/EFTA-India ICT Business Dialogue, with a focus on digital connectivity, standards, and technology collaboration

2022 — In 2022, India's DataSmart Cities Initiative won the Platinum Icon in the Digital India Awards. The EU supported digital transformation through the Living-in.EU movement and implemented local data platforms.

2023 — Establishment of three working groups, including one focused on digital connectivity, during the Trade and Technology Council (TTC) meeting in Brussels, highlighting areas such as 5G, 6G, AI, quantum computing, and digital skills.

CONNECTIVITY IN SMART CITIES: DIGITAL

The central idea driving the digital transformation of both the EU/EFTA and India is a focus on "human-centric digitalization for fostering inclusive economies and societies." In their July 2020 summit, these two entities concurred on advancing worldwide digitization standards that prioritize secure and ethical implementation. Their key projects, the EU/EFTA digital single market and 'Digital India,' position them as well-suited collaborators in championing these global standards.

INDIA

2022: Smart city market valuation in India -6.11 billion EUR ⬌ **Projection: Estimated CAGR of 25.2% from 2023 to 2031** ⬌ **2031 Target: Aim to reach 44.9 billion EUR valuation**

EU/ EFTA

Smart Cities market revenue: Estimated to hit €24.08 billion in 2023 ⬌ **Annual growth rate (CAGR 2023-2028): Expected at 12.42%** ⬌ **Anticipated market volume by 2028: Envisioned to reach €43.24 billion**

In India, the government launched a number of initiatives to promote digital connectivity in smart cities. These initiatives include the Smart Cities Mission, the National Digital Communications Policy, and the BharatNet project. The Smart Cities Mission aims to develop 100 smart cities across India by 2022. The National Digital Communications Policy aims to make India a digitally empowered society and knowledge economy. The BharatNet project aims to provide high-speed broadband connectivity to all villages in India.

The smart city market in India is a growing and promising market. The smart city market in India is expected to grow at a CAGR of 21% from 2023 to 2031. This growth will be driven by the factors including:

- **Rise in urban population:** India is one of the most urbanized countries in the world, with its urban population expected to reach 1.6 billion by 2050. This rapid urbanization is putting a strain on existing infrastructure and services, and smart city solutions can help to address these challenges.
- **Increase in government focus on smart cities:** The Indian government has made smart city development a priority, and has launched several initiatives to support this goal. This includes the Smart Cities Mission, which aims to develop 100 smart cities across India.
- **Accelerated innovation and technology developments:** New technologies such as artificial intelligence, IoT, and blockchain are being rapidly developed and adopted, and these technologies have the potential to transform the way cities are managed.
  In the EU/EFTA, the European Commission has also launched a number of initiatives to promote digital connectivity in smart cities. These initiatives include the Smart Cities and Communities Initiative, Connecting Facilities, and the Digital Agenda. The Smart Cities and Communities Initiative aims to help cities develop and implement smart solutions to improve the quality of life for their citizens.
  The Connecting EU/EFTA Facility is a financial instrument that supports investments in trans-European networks, including high-speed broadband. The Digital Agenda for EU/EFTA aims to make the EU/EFTA a digital single market.
- As of 2021, India's IT & IT-enabled services (ITeS) exports to the EU/EFTA were valued at approximately €40 billion (NASSCOM).
- The Startup Europe India Network (SEINET) continues to advise on scaling up tech firms and issues related to venture capital, impact innovation, and investment sourcing in European and Indian markets.
- Collaboration between 5G/6G Infrastructure Association (5G IA) and India's Research through Telecom Programme Standards Development Society, India (TSDSI) in the field of 5G/6G is ongoing, facilitating research, policy development and Standardization.
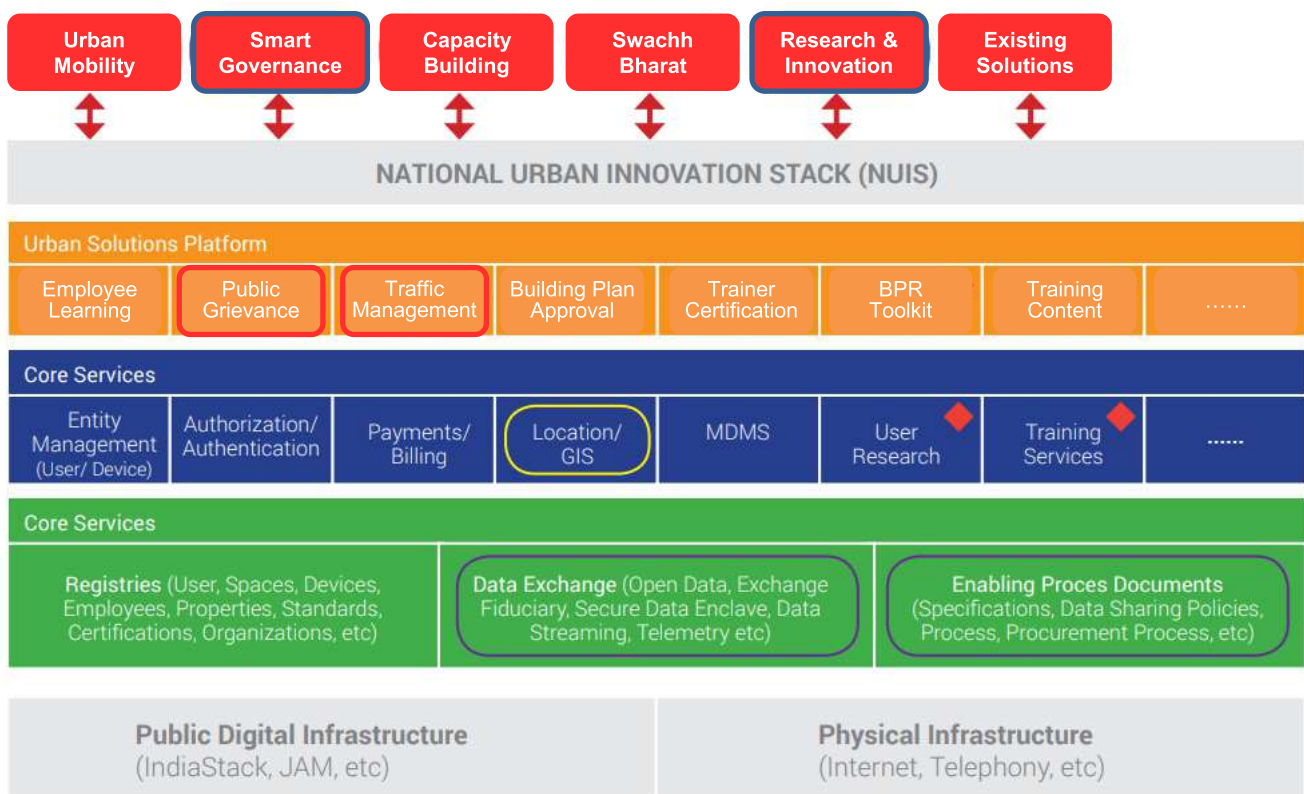
SECTOR PROFILE:
MARKET DYNAMICS

The Smart Cities Mission, in partnership with the Ministry of Housing and Urban Affairs (MoHUA) and the National Institute of Urban Affairs (NIUA), has jointly introduced a strategy document outlining the National Urban Innovation Stack (NUIS). This slide serves as the foundational blueprint for the entire concept, which plays a crucial role in establishing a sturdy framework for the DataSmart platform, marking the principles of digital technology, potential sourcing model, and publishing model for city data. Additionally, it outlines the importance of the SmartData Platform and its specific position within the broader ecosystem.

Source: DataSmart_Cities
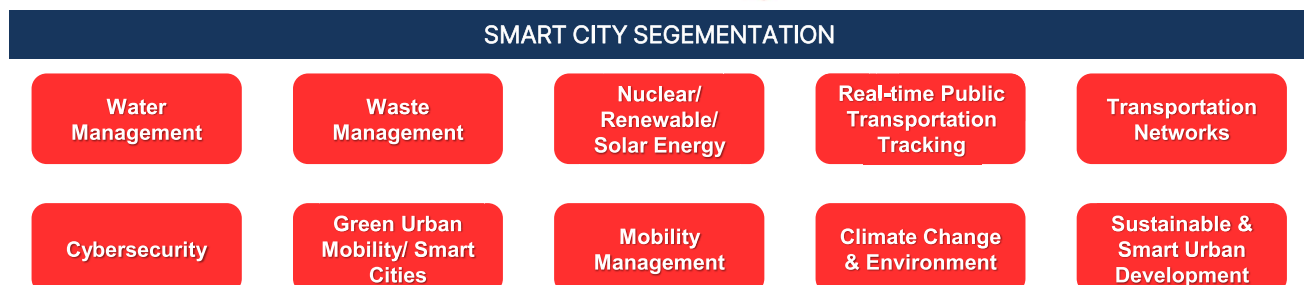
The digital aspect connects all the macro and micro level segmentation, incl. Energy, Transport, Healthcare, Education, Water Management, Waste management, Public Safety, Urban planning amongst others. This paper highlights these parameters thereby underlining that the digital aspects / data platforms hold paramount significance within this entire concept.

CONNECTIVITY IN SMART CITIES: ENERGY

The EU/EFTA is a leader in renewable energy, prioritizing wind and solar power and moving away from nuclear and coal. They encourage competition through liberalization and cross-border trading, while investing in smart grids and energy storage for stability. Their policies focus on sustainability, innovation, energy efficiency, and carbon neutrality.

India's energy sector is rapidly growing with a focus on solar and wind energy, driven by initiatives like Saubhagya Yojana.Despite coal's presence, India is transitioning, integrating grids, and reducing its carbon footprint. The sector values entrepreneurship, innovation, and sustainable development, benefiting from regulatory support and foreign investments that promote economic growth and environmental sustainability. Govt. of India has launched programmes like subsidy for solar roof top, FAME I & II, while EU/EFTA has schemes like Horizon 2020, CIVITAS Initiative, TEN-T, European green deal for promotion of smarted energy and transportation sector in their cities.

Category	EU/EFTA	India
GRID MIX	Dominance of renewables 38% renewables; 25% nuclear; 20% coal	Coal-reliant 54% coal; surging renewables at 24%; nuclear 2%; hydro 13%
INCREASING TRENDS	Wind and Solar	Wind and Solar
DECREASING TRENDS	Phasing out of coal in many countries	Gradual decrease of non-renewables due to policy shifts and commitments
PRIMARY SECTORS	Industrial (42%); Residential (25%); Transportation (20%)	Industrial (40%); Residential (24%); Agricultural (18%)
FUTURE TRENDS	Accelerated transition to renewables; smart grids	Rapid growth in renewables; alternative fuels, energy storage
BUSINESS POTENTIAL	Investment opportunities and innovation in renewable energy	Renewable integration in solar and wind energy projects, electronic mobility
POLICY FOCUS	EU Green Deal, EU Horizon	National Solar Mission, FAME I and II, National Smart Grid Mission with component of rapid Smart meter penetration
INTERNATIONAL COLLABORATION	Common Energy Market, Cross Border Connectivity	Bilateral Agreements, Technological Collaborations

CONNECTIVITY IN SMART CITIES: TRANSPORT SECTOR

In the EU, smart city transportation prioritizes green mobility, advanced tech, and autonomous vehicle testing. It also focuses on integrating public transport for seamless transit networks and emphasizes smart traffic management and sustainability.

India's smart city transportation is shifting toward sustainability and tech innovation. Government policies promote electric mobility and mass transit systems, while smart tech enhances traffic management. Innovative solutions like bike-sharing and last-mile connectivity cater to diverse transportation needs, offering opportunities in EV charging infrastructure, smart mobility, and sustainable public transport development.

Category	EU/EFTA	India
FUEL TYPES	Diesel (37%); Petrol (25%); Electric (3.2%); Natural gas (2.1%)	Petrol (70%); Diesel (23%); Electric (0.1%); CNG (6%); Biofuels (0.1%)
INCREASING TRENDS	Rapid adoption of EVs supported by incentives	Significant growth of EVs due to government incentives
DECREASING TRENDS	Decline in diesel vehicles due to promotion of EVs	Gradual reduction of ICE vehicles due to promotion of EVs
ALTERNATIVES FUELS	Biofuels and Hydrogen	CNG, Compressed biogas and hydrogen, Ethanol
INFRASTRUCTURE	Dense network specially of charging infrastructure specially in urban areas, good network for non motorized travel	Expansion and Improvement of charging infrastructure and non motorized transport infrastructure
FUTURE TRENDS	Autonomous vehicles testing and implementation efforts	Mass Rapid Transit system/Multi modal transit in urban agglomerations
BUSINESS POTENTIAL	Charging infrastructure, Autonomous vehicles	Electric Buses, Battery storage, Hydrogen, CBG
POLICY FOCUS	Emission reduction	Sustainable urban mobility, Vehicle Scrappage Policy, Promotion of alternative fuels

Digital connectivity in smart cities, particularly in India and the EU/EFTA region, is a complex landscape marked by numerous challenges. These challenges span across various sectors such as Smart Waste Management, Smart Water Management, and Public Safety and Data Analytics. Despite these challenges, the future potential of digital connectivity in smart cities is immense. As technology advances and governments implement supportive policies, there is significant potential for growth and innovation in the digital sector of smart cities. This potential extends from enhancing smart waste management to leveraging data analytics for effective urban planning. Mentioned below are some of the critical applications that hold immense future potential along with their recommendations:

CONNECTIVITY IN SMART CITIES: DIGITAL - FUTURE POTENTIAL			
Application Based	**India**	**EU/EFTA**	**Future Potential**
SMART WASTE MANAGEMENT	• **AWMINS:** Smart bins for IoT garbage sorting. • **Waste Segregation and Recycling:** Policies for better waste segregation: awareness, incentives, enforcement. • **Waste-to-Energy Projects**: Expand waste-to-energy for urban waste and energy. • **Smart City Consultants:** Professionals are crucial in devising a waste management strategy for a smart city's development plan. • **Earthzy:** It is a Bengaluru-based company that develops innovative technology for efficient waste management, including their flagship product, RecycloBin, a smart waste compactor bin.	• Integrate "**IoT-Enabled Waste Management Systems**" with "Green IoT for Eco-Friendly Smart Cities" for efficient waste management. • AI in waste management: Enhances waste-to-energy, optimizes smart bins, enables sorting robots, improves waste models, tracks waste, aids plastic pyrolysis, streamlines logistics, prevents illegal dumping, boosts resource recovery, and promotes smart cities for efficiency and public health.	• India and the EU/EFTA collaborate on smart waste management R&D. • India learns from EU's ENS, SMART WASTE, and Digital Technologies projects. • EU/EFTA could share knowledge from India's AWMINS and Earthzy Technology Solutions. • Jointly develop IoT-enabled waste management, AI, partnerships, segregation, recycling, and waste-to-energy projects.
SMART WATER MANAGEMENT	• **Urban Water Monitoring System:** Andhra Pradesh advances Smart Water Grid tech. • **Smart Water Future:** Coimbatore innovates water management with Germany. • **Digitalization:** Digital infrastructure combats India's water crisis. • Smart management curbs water waste. • **Smart Meter-Based System:** Smart meters optimize water distribution in cities like Chandigarh and Pune.	• **EU/EFTA's Water-Futures project** for UN Agenda 2030 water equity. • EU/EFTA's sustainable approach via **Water Framework Directive** (WFD) • **Water Management Digitalization:** European Commission's smart water tech strategy. • EU/EFTA's future smart water projects for AMI systems. • **Water 4.0:** Digital water management evolution.	• Create India-EU/EFTA Water Innovation Hub for smart water cooperation. • Partner on Water 4.0 R&D, digital infrastructure, and smart metering. • India could collaborate with EU/EFTA for implementing Water Framework Directive in India. • Raise awareness and engage stakeholders for water conservation.
SMART METER LIGHTING	• Consumer resistance to energy-efficient developments is decreasing, EESL is helping in the development. • India needs more smart grid for rising electricity demand. • Tech like AI can cut losses, improve billing, and monitor power network inefficiencies.	• The EU/EFTA's Smart Cities Marketplace focuses on integrating and advancing city infrastructures. • Public lighting, using over 20% of city energy, is transitioning to energy-efficient LEDs and smart lighting.	• India and EU/EFTA unite for renewable energy smart grid, fast-tracking smart meter adoption through funding and knowledge sharing.

(Contd...) CONNECTIVITY IN SMART CITIES: DIGITAL - FUTURE POTENTIAL			
Application Based	**India**	**EU/EFTA**	**Recommendations**
PUBLIC SAFETY SURVEILLANCE	• Indian Smart Cities invest in surveillance tech for public safety. • Technologies like facial recognition, drones, and body cameras enhance safety. • Promote women's rights and safety in Indian cities. • Study on smart city safety systems is underway.	• Create open platform for info sharing in smart city. • S4All Cities enhances city infrastructure and security info exchange. • Study on early warning systems for smart city safety.	• India, EU/EFTA could invest in advanced surveillance tech. • Develop open info-sharing platform for public services. • Use AI, facial rec, biometrics, drones for safety. • Explore EU/EFTA's S4AllCities project collaboration with India. • Rights-based approach for women's city safety; Build public safety risk management framework..
DATA ANALYTICS AND URBAN PLANNING	• AI transforms data analytics, automating tasks, while 5G pushes analytics to the edge; India's Finance Minister promotes sustainable cities with a 1.103 billion Euros fund and creditworthiness initiatives.	• EDM Monitoring Tool enhances EU data market insights. • Data Governance Regulation aims for EU data revolution. • SUD Strategies foster sustainable EU urban growth. • EU allocates 8% ERDF for member state SUD projects.	• India and EU could collaborate in AI-driven data analytics with EU's EDM Tool; Automation boosts data analytics, cuts costs. • 5G-edge computing speeds up analysis. • EU Data Governance Regulation may inspire India. • EU's creditworthiness model helps India's urban dev.

CONNECTIVITY IN SMART CITIES: ENERGY - FUTURE POTENTIAL			
Application Based	**India**	**EU/EFTA**	**Future Potential**
GREEN BUILDINGS	• GRIHA and LEED-India: Popular green building rating systems in India. • Suzlon One Earth (Pune), BCIL (Bangalore), Rajiv Gandhi Airport, Infosys Limited (Mysuru): Buildings with these green certifications.	• BREEAM, DGNB, HQE, and LEED are common green building rating systems in Europe. • Examples include The Edge in Amsterdam which is a sustainable working space, The Viikki Village in helsinki which is a sustainable residential area.	• India can adopt EU/EFTA's DGNB principles for balanced green building standards. • EU/EFTA's DGNB considers environmental, social, and economic aspects equally. • Indian standards emphasize specific parameters: air, water, and waste.
ELECTRICITY STORAGE	• Batteries and Pumped Hydro Storage: Battery storage projects and pumped hydro storage are gaining attention. For example, the National Thermal Power Corporation (NTPC) has been working on energy storage solutions, including a 10 MW battery energy storage system in the Andaman and Nicobar Islands • Scaling Up Battery Storage: There is considerable potential for scaling up battery storage projects, especially as the costs of batteries continue to decrease. This can enhance grid stability and support the integration of more renewable energy. • Extended Producer Responsibility principle holds producers accountable. • Producers collect, recycle, and reuse materials in new batteries. • Dumping of batteries in landfills and incinerators forbidden.	• Advanced Grids: The EU/EFTA has been investing in smart grids to accommodate the increasing share of renewables. Battery storage, along with other storage technologies, plays a crucial role in enhancing grid flexibility and reliability. • Rapid Growth in Battery Storage: The EU/EFTA has been witnessing rapid growth in battery storage installations. Various countries, including Germany and the Netherlands, have implemented large-scale battery projects to support renewable energy integration.	• More and more integration of renewable powered micro grids in India and EU/EFTA. • Invest of grid scale energy storage like pumped hydroelectric, compressed air energy storage etc. • Decentralization of energy storage systems. • Financial incentives, tax credits and subsidies for innovative energy storage solutions along with R&D. • There is scope for Cross-Border Cooperation in the EU/EFTA for electricity storage. This will lead to more efficient utilization of resources. This could involve standardized regulations and interconnections to facilitate the movement of stored energy across borders. • Continued investment in research and development is essential for advancing energy storage technologies. Innovation can lead to breakthroughs in battery technologies, making them more efficient and cost-effective
ENERGY MANAGEMENT	• Indian government establishes smart metering infrastructure. • EESL's Smart Meter National Programme replacing 250 million meters. • Smart meters help manage peak demand and offer time-based tariffs. • BSES Rajdhani Power Limited initiates India's first Home Energy Reports (HERs) pilot program in New Delhi.	• EU/EFTA energy conservation plan in REPowerEU aims to reduce gas demand by 15% in July 2022 and to lower electricity use by 5% to 10% in September 2022 • Building energy efficiency based on directives like Energy Performance of Buildings, Renovation Wave, Ecodesign, and Energy Labelling.	• Implement Demand response programs (DRPs) for voluntary electricity reduction during peak demand periods to enhance grid reliability and promote energy efficiency in smart cities. • Prioritize and enhance standardized communication protocols and data formats to improve interoperability among diverse energy management systems in Indian and European smart cities.

CONNECTIVITY IN SMART CITIES:TRANSPORT - FUTURE POTENTIAL			
Application Based	**India**	**EU/EFTA**	**Future Potential**
SHARED PUBLIC MOBILITY	• MoRTH issues guidelines for liberalizing taxi permits and promoting vehicle sharing services. • National policies like the Urban Transport Policy, Data Sharing Policy, and Motor Vehicles Amendment Bill aim to enhance mobility services in India. • Initiatives like differentiated toll plaza charges. • The "Chalo Pay" app facilitates direct payments to conductors with as little as RS. 10 recharge.	• Shared scooters in EU/EFTA: Increasingly regulated via public tenders with varying outcomes • Successful tenders: Clear criteria, transparency, quality standards • Tenders can limit vehicle numbers and operators • Bordeaux and Oslo examples: Improved profitability and service quality • Personalized services: User preferences and trip specifics considered • Multiple routing options for time-cost comparison • Flexible payment options: Irregular users and subscription bundles	**India:** • Efficiently manage existing transportation infrastructure in India, enhancing station areas and prioritizing first/last-mile connections to public transport. • Accelerate the shift to e-buses and EVs in India with incentives and expanded charging infrastructure for sustainability. • More use of renewable fuel sources like biogas, biodiesel and ethanol. **EU:** • The European Parliament can assist members with national mobility policies through funding, policy support, capacity development, or linking funding eligibility to rural mobility policy development. • Empower local communities to lead initiatives and harmonize regulations for walking and cycling networks. • Improve mobility services by investing in cross-border public and shared mobility services. • Increase EV adoption, implement digital ticketing solutions, and raise awareness of public mobility benefits.
EV AND ALTERNATIVE FUEL VEHICLES	• Electronic mobility in India drives lithium-ion battery demand • 6,586 public charging stations in India • BEE's app locates nearest EV charger • No license needed for charging under Electricity Act, 2003 • Rs. 1,000 Cr. allocated for charging infrastructure in FAME-India Phase II • 2,877 EV charging points in 25 states/UTs approved • 1,576 charging stations on 9 expressways and 16 highways approved • Ministry of Power allows home/workplace charging • MoHUA updates Model Building Bye laws, 2016 for charging stations • Biogas production hasn't reached expected levels even after five years of SATAT.	• Lithium-ion batteries dominate European storage additions. • EU/EFTA leads in EV adoption with 375,000 charging outlets in 2021. • Norway initiated tax incentives for EVs in the 1990s. • Alternative Fuels Infrastructure Directive (2014) boosts charging facilities. • 2018 Energy Performance of Buildings Directive mandates recharging points in certain buildings. • CO_2 Emission Regulation 2020 supports green initiatives.	**India:** • Offer financial incentives (e.g., reduced GST rates) for EV affordability • Rapidly expand charging infrastructure, especially along highways • Establish consistent regulatory frameworks for EVs nationwide. • Explore alternative fuels like biogas with rural feedstock **EU:** • Harmonize EV incentives across member states • Standardize charging protocols • Invest in R&D for alternative fuel sources • Promote awareness of EV and alternative fuel benefits • Encourage public-private partnerships for cleaner transportation solutions

(Contd…) CONNECTIVITY IN SMART CITIES: TRANSPORT - FUTURE POTENTIAL			
Application Based	**India**	**EU/EFTA**	**Recommendations**
CYCLING AND WALKING (NON MOTORIZED TRANSPORTATION)	• Indian government promotes cycling and walking through the "Green Mobility Scheme." • Aims to enhance connectivity, safety, and accessibility for pedestrians and cyclists. • National challenges with ITDP encourage innovative walking and cycling solutions. • Pune's Complete Street scheme, guided by ITDP, transformed 100+ km of pedestrian and cyclist-friendly streets. • JM Road and DP Road's redesign in Pune received national recognition and awards. • Pimpri-Chinchwad also began designing 75 km of pedestrian-friendly streets.	• **Pan-European Master Plan for Cycling Promotion** recommends allocating space for cycling and walking • Suggests improving active mobility infrastructure • Advocates for increasing cyclist and pedestrian safety • Encourages the development of national cycling policies • Promotes integration of cycling into health and urban planning • **Paris Mayor's 2022 Traffic Restriction Plan**: • Restricts vehicle traffic in city center to reduce pollution and noise • Prioritizes walking and cycling • Exceptions for residents, people with disabilities, and essential services • Expected to cut 55% of daily traffic (over 100,000 cars) • Allocates 50% of on-street parking to pedestrians and cyclists • Establishes a 650km cycle network • Prior actions include banning diesel cars and expanding sidewalks	• Strengthen public health professionals' awareness to promote cycling for better health. • Promote cycling benefits through education from early childhood. • Integrate non-motorized transport in India's city planning for cleaner, multi-modal commuting.
INTELLIGENT TRAFFIC MANAGEMENT	• **ODAWS, BSPS, and CoSMiC launched under Ministry's ITS Phase-II initiative**. • ODAWS: Real-time audio and visual alerts for driver assistance; Monitors driver behavior and vehicle environment. • BSPS: Improves public bus handling at signal-controlled junctions; Conditional priority, not blind priority like emergency vehicles. • CoSMiC: Middleware software for vendor-specific standards; Enhances interoperability with smart city dashboard.	• European Parliament and Council agree on revised **ITS Directive for data availability.** • Revised ITS Directive includes automated mobility, booking, ticketing, multimodal info, and vehicle-infrastructure communication. • New regulations set deadlines for critical services and digitization of data like speed limits. • Benefits for users: real-time info, intelligent road infrastructure, precise speed assistance. • Updated guidelines promote Cooperative ITS for vehicle-road communication.	• Indian traffic management firms should look for tailored and local solutions. • Widespread adoption of ITS can revolutionize traffic management, enhance flow, save fuel, and promote sustainability. • AI insights enable smarter urban mobility, benefiting the environment and the public. • India needs national ITS guidelines for local requirements. • Robust data infrastructure and secure data management are vital for effective traffic management and mass ITS deployment.

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POLICY
INITIATIVES

Digital connectivity in smart cities encompasses a spectrum of technologies, from high-speed broadband networks to sensor-laden infrastructure. These technologies form the foundation upon which smart city solutions are built, facilitating everything from efficient transportation systems to responsive healthcare services. It is through strategic policy frameworks and initiatives that cities are navigating this complex landscape, striving to ensure that every citizen reaps the benefits of a connected urban future. Some of these are mentioned as below:

CONNECTIVITY IN SMART CITIES:DIGITAL – POLICY		
Geography	Policy Name	Policy Description
India	Data Smart Cities Strategy (DSC) (2015)	An initiative to make 100 Smart Cities with open data portals.
	Smart Cities Open Data Portal (2020)	A platform for cities to share data.
	Data Maturity Assessment Framework (DMAF) (2019)	A tool for cities to assess their data maturity.
	Integrated Command and Control Centre (ICCC) (2015)	Acts as the "nerve center" for operations management, day-to-day exception handling, and disaster management in a smart city.
	India Urban Data Exchange (IUDX) (2021)	An open-source software platform that facilitates secure and authenticated exchange of data among various data platforms, third-party applications, data producers, and consumers.
	National Digital Communications Policy (NDCP) (2018)	Aims to unlock the transformative power of digital communications networks to achieve the goal of digital empowerment and improved well-being of the people of India.
	City Data Policy (CDP) and City Data Officer (CDO)	Roles and policies for managing city data.
EU/EFTA	Living-in.EU movement (2019)	A city-led platform for accelerating digital transformation.
	Local data platforms	Implementing interoperable local data platforms that integrate data flows within and across city systems.
	Data space for smart communities (2022)	Facilitating data sharing through the creation of a data space for smart communities.
	Local digital twins (2022)	Building the capacity of cities to implement their local digital twins.

(Contd..) CONNECTIVITY IN SMART CITIES:DIGITAL – POLICY		
Geography	Policy Name	Policy Description
India-EU/EFTA Policy Collaborations	**City Investments to Innovate, Integrate and Sustain, CITIIS 1.0 (2018)**	A joint program of the Ministry of Housing and Urban Affairs, AFD, EU, and NIUA. The program had a total outlay of EUR 106 million. It aims to support competitively selected projects promoting circular economy with focus on integrated waste management at the city level, climate-oriented reform actions at the State level, and institutional strengthening and knowledge dissemination at the National level.
	CITIIS 2.0 (2023)	Approved in **2023**, with an investment of EUR 200 million by AFD and KfW, alongside a grant of EUR 12 million from the EU/EFTA. It aims to provide financial and technical support for up to 18 Smart Cities for projects promoting circular economy with focus on Integrated Waste Management, support to all States/Union Territories (UTs) for Climate action, and interventions at National level to support scale-up across all cities and towns.

POLICY INITIATIVES

CONNECTIVITY IN SMART CITIES: ENERGY – POLICY		
Geography	**Policy Name**	**Policy Objective**
India	**Solar Rooftop Scheme**	For promotion of decentralized solar energy production to meet India's 2030 Nationally Determined Contribution (NDC) target
	Saubhagya from urban areas, Atal Distribution Improvement Scheme (ADITYA), IPDS	Provision of sustainable energy for all through smart grids and decentralization
	PM UJALA, National Street Lighting Program (SNLP), Ujjwal DISCOMs Assurance Yojana (UDAY), Energy Conservation Act, PAT scheme	Energy efficiency
	FAME I and II	Promotion of cleaner mobility
EU/EFTA	**Renewable Energy Directive (RED I and II)**	More renewable power production
	EU's Energy Efficiency Directive	Energy efficiency.
	EU's Emission Trading System (EU ETS)	Facilitation of carbon markets and better compliance
	Just Transition Fund of Europe	Investments

INDIA:

● Apart from some of the schemes mentioned above, MoEFCC provides swift environmental clearance for green construction projects with IGBC approval. These projects are eligible to receive low-cost financial support from SIDBI.

● The Energy Conservation Act,2001 mandates energy-saving criteria for big energy consumers, large commercial buildings, and appliances. BEE's Energy Conservation Building Code aims to decrease India's baseline energy consumption. EIA is mandatory for large-scale development projects under the Environmental Protection Act (1986).

● State governments of Punjab, Rajasthan, West Bengal, Maharashtra, Andhra Pradesh, Himachal Pradesh, Jharkhand, and Haryana have increased floor-to-area ratios for GRIHA and IGBC projects, with some states offering additional benefits on permit fees, building scrutiny fees, and property transfer duty.

● India is advocating the concept of a micro grid system to make it easier to provide electricity in rural areas. 2008 saw the installation of India's first micro grid test bed at the Institute of Engineering and Technology. The government of India drafted a national strategy in 2016 with a specific reference to the growth and future of micro grids, concentrating primarily on expanding the investment potential in micro grids and assuring last mile connectivity.

- The CEA regulation, which was announced in 2013 in a draft known as "Technical Standards for Connectivity of Distributed Generation Resources," must be followed for the interconnection of micro grids with the distribution business. The Ministry of New and Renewable Energy drafted "National Policy Renewable Energy-Based Micro- and Mini-Grids" in 2016 to encourage the building of micro grids based on renewable energy sources. For R&D in micro grids, there are also several partnerships involving private and public players.

EUROPEAN UNION:

- Among EU/EFTA countries, Poland requires meeting existing levels of thermal insulation for new buildings. Lithuania provides grants to poor families for renovation in association with EIB; similarly, the Irish Warmer Homes Scheme of Ireland provides funds and advice to low-income families for achieving energy efficiency.

- The EU/EFTA introduced the Batteries Directive, 2018 and the reformed Electricity Directive, 2019, to promote renewable resources and improved energy storage. The Renewable Energy Directive, 2018 emphasizes energy storage for easier integration of renewable technology. The European Commission's The European Battery Alliance supports R&D and manufacturing capacity scaling. In the third 'Europe on the move' mobility package, a dedicated strategic action plan on batteries was adopted covering raw materials extraction and processing, cell production, reuse and recycling, etc. The Circular economy action plan as part of European Green Deal identified batteries among resource-intensive sectors with high potential for circularity as a priority.

- The EU/EFTA is the one of the leading contributors in micro grid project introduction and adoption in the world. In 2017, the European Commission funded more than 80 micro grid projects across several European Union member countries. Horizon 2020 is a seven-year funded project which started from 2014 till 2020 for research and innovation program. So far, Innovation and Networks Executive Agency (INEA) signed a grant agreement for 14 projects of total €135 million from the EU's Horizon 2020 program, for developing new clean energy solutions on the Smart Cities & Communities and Smart Grids & Storage topics to help modernize the European energy grid through developing solutions for integrating renewable energy technologies. Several EU/EFTA member states have their independent energy policies as well for micro grid.

CONNECTIVITY IN SMART CITIES: TRANSPORT – POLICY		
Geography	Policy name	Policy objective
India	Bus Rapid Transit System (BRTS) for dedicated bus lanes.	Provision of sustainable energy for all through smart grids and decentralization
	Vehicle Scrappage Policy:	Resource efficiency and cost savings
	FAME I and II, SATAT Scheme	Promotion of alternative fuel mobility and EVs
EU/EFTA	European Mobility Week: To connect a network of cities with better transportation	For promotion of sustainable mobility among Europeans and encourage non motorized transportation like walking, cycling etc.
	CIVITAS	Increasing accessibility of sustainable and smart mobility for Europe and beyond
	Horizon 2020	For funding urban mobility initiatives in Europe.

INDIA:

Apart from some of the initiatives mentioned above, Indian govt has also announced following:

- Atal Mission for Rejuvenation and Urban Transportation (AMRUT), Smart Cities Missions: Infrastructure for public transportation, non motorized transportation and last mile connectivity

- SATAT Scheme in the only in India that incentivizes CBG entrepreneurs to establish new facilities or increase the capacity of existing ones for selling CBG to OMCs as industrial or vehicle fuel. Loans up to 75% of the project cost are available for viable SATAT projects. India's initiation of the Global Biofuel Alliance during its G20 leadership is a positive step forward.

- As part of FAME-India Phase II, Rs. 1000 Cr. has been set up for charging infrastructure across states with a focus on highways. The Electricity Act, 2003 allows for charging car batteries at charging stations without a license. The amended Model Building Byelaws allows for charging stations in public and private buildings.

- PM of India also launched the 'One Nation One Mobility Card' for enabling seamless multimodal transportation in India cities. The National Common Mobility Card (NCMC) is an automatic fare collection system that turns the smartphone into an inter-operable transport card that can be used to pay for metro, bus and suburban railway services.

EUROPEAN UNION:

- The EU/EFTA is leading the world in the EV adoption which was initially boosted by significant regional and national tax incentives which began as early as 1990s in Norway. The Alternative Fuels Infrastructure Directive (2014) aimed to increase the number of charging and battery swapping facilities. The Energy Performance of Buildings Directive (2018), and the CO2 Emission Regulation (2020) are other policies in this direction France plans to introduce social leasing to make electric cars accessible to lower-income households.

DIGITAL SECTOR

APPLICA TIONS	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
CENTRE OF EXCELLENCE (CoE)	NASSCOM's Centre of Excellence for IoT & AI is pivotal in aligning standards for digital connectivity in India's smart cities. Collaborating with MeitY, it aids in standardizing policies, supporting the Smart Cities Mission 2015 to leverage technology for economic growth and improved quality of life. The Ministry of Electronics and Information Technology (MeitY), the SCM of India and the state of Telangana, have institutionalized a Smart City Research Center (living lab) at the International Institute of Information Technology (IIIT), Hyderabad, in collaboration with the EBTC and Amsterdam Innovation Arena (AIA), Netherlands.	The European Innovation Partnership on Smart Cities and Communities (EIP SCC) aligns digital connectivity standards across EU smart cities. It leverages innovative technologies, funding, and partnerships, with a Strategic Implementation Plan and six action clusters for specific development areas. An initiative involving 110 cities and 93 industry partners under the EIP SCC created a reference architecture for an open urban platform, now a DIN standard and moving towards international standardization. The EIF4SCC provides a framework for interoperability, aiding smart city development. **Living-in.EU:** This is a city-led collaborative platform for cities and communities to accelerate their digital transformation the 'European way' (citizen-centric approach, ethically and socially responsible data usage, co-creation with and engagement of citizens, open and interoperable standards). It has adopted the EIP-SCC goal to scale up these solutions into a real-life deployment in the majority of EU/EFTA cities with 300 million citizens benefiting from services running via urban platforms.	• NASSCOM (India) and EIP SCC (EU) can collaborate to align smart city standards, share best practices, and conduct joint research in areas like IoT, 5G, and Intelligent Transport Systems. • They can initiate projects to address common challenges and foster mutual learning through exchange programs. • Standardization efforts can ensure solution interoperability across regions, accelerating the digital transformation of cities.
PRIORITY AREAS	Cyber Security, 5G technology, AI, Smart Energy and Intelligent Transport Systems (ITS), key to smart city digital connectivity. It addresses data security, high-speed communication, Efficient Energy and intelligent infrastructure.	The India-EU/EFTA Trade and Technology Council (TTC), established in 2022, focuses on areas such as AI, 5G/6G, computing technologies, cybersecurity, digital skills, clean energy, circular economy, waste management, and resilient value chains. The Trade and Technology Council (TTC) ensures interoperability and security through collaboration on technologies like AI, 5G/6G, and cybersecurity. Project SESEI priority topics are also aligned with TTC topics for collaboration on their standardization.	• Collaboration with the Trade and Technology Council (TTC) ensures interoperability and security through its WG-1. India and EU shall continue its engagement through TTC and Project SESEI for R&D, Policy and Standardization.

STANDARDIZATION

APPLICA TIONS	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
POLICY COLLABORATION	Digital India, Smart Cities Mission, National Digital Communication Policy, Data Privacy etc. are initiatives that develops policies and guidelines to ensure interoperability of digital technologies, promote global standards, and address smart city-specific connectivity. This is achieved through collaboration between government bodies, industry stakeholders, and technology providers. The aim is to build a robust ICT infrastructure that supports smart city initiatives, considering aspects like privacy, cybersecurity, open data, and digital accessibility. These efforts drive the digital transformation of cities, making them smarter and more efficient.	The European Commission collaborates with smart cities and communities to tackle local challenges, improve citizen services, and achieve the European Green Deal objectives. The European Innovation Partnership on Smart Cities and Communities (EIP SCC) is a key initiative in this regard, bringing together stakeholders in six action clusters and initiating Smart Cities Lighthouse Projects. The Commission has seen positive results in areas like smart grids, energy efficiency, and water sector digitization. It's also exploring a common format for energy data exchange at the EU level under the Smart Grids Task Force. Digital Single Market, Digital Europe Programme are other initiatives in the similar directions.	• Collaborating on advocating for supportive policies and regulations. India's "**Digital India**" initiative & EU/EFTA's "Digital Europe Programme" can serve as reference points for aligning regulatory frameworks and associated Standardization Activities.
TRAFFIC MANAGEMENT SOLUTIONS	Standardization policies in traffic management solutions for smart cities in India can be implemented through a combination of adaptive traffic control systems, AI initiatives, intelligent transport systems, IoT platforms, global standardization efforts, and robust digital infrastructure. These strategies aim to improve traffic flow, enhance road safety, and create efficient transport systems by leveraging technology and digital connectivity.	In the EU/EFTA, smart city traffic solutions are standardized through a harmonized approach using digital connectivity, adaptive traffic control, AI, and IoT. The EU's Smart City Standardization Initiative ensures interoperability of urban platforms. The Living-in.EU movement advocates for responsible data usage and citizen co-creation. These strategies aim to improve road safety, traffic flow, and transport sustainability in EU/EFTA smart cities.	• Adopt a blend of strategies such as adaptive traffic control, AI, intelligent transport systems, and IoT for traffic management in smart cities. • Promote global standardization and robust digital infrastructure. • Implement strategic traffic management plans and interoperability efforts. • Encourage citizen-centric initiatives like the Living-in.EU movement and local digital twins. • Tailor these strategies to each city's unique needs to optimize traffic flow and road safety.
KNOWLEDGE EXCHANGE AND EXPERTISE SHARING	The **Integrated Command and Control Centers (ICCC)** and the **India Urban Data Exchange (IUDX)** are pivotal to India's Smart Cities Mission. The ICCCs integrate urban services using ICT, while the IUDX facilitates secure data exchange. Together, they standardize digital connectivity in smart cities.	The **European Innovation Partnership on Smart Cities and Communities (EIP-SCC)** aligns digital connectivity standards across EU smart cities, leveraging innovative technologies, funding, and partnerships. The **European Platform for Intelligent Cities (EPIC)** provides a platform for data exchange among various stakeholders, aiding in the standardization of digital connectivity in smart cities.	• A collaboration between these platforms could facilitate the exchange of best practices and innovative technologies. • This partnership could align digital connectivity standards and enhance the efficiency of urban services. • Such a collaboration could accelerate the digital transformation of cities in both regions, making them smarter and more efficient.

APPLICA TIONS	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
INDUSTRY ASSOCIATIONS	**Federation of Indian Chambers of Commerce & Industry**(FICCI), plays a pivotal role in influencing policy, engaging with policy makers and civil society to articulate the views and concerns of industry. In the context of smart cities, FICCI has advocated for the adoption of global standards for digital connectivity, emphasizing the need for interoperability and compatibility of various ICT systems and devices across different domains and sectors. The Confederation of Indian Industry (CII) contributes to the development of smart cities in India by advocating for policy reforms, fostering public-private partnerships, and promoting technological innovation. The Associated Chambers of Commerce and Industry of India (ASSOCHAM) plays a role in the standardization of policies in digital connectivity in smart cities in India.	Europe-based organizations such as Digital Europe work on removing trade barriers for European industry and consumers. and aims to produce high-quality standards for products and services that incorporate quality, safety, environmental, interoperability, and accessibility requirements. AIOTI, The Internet Of Things (IoT) Plays An Increasing Role In The Modern World. It Dictates Both Our Daily Lives At Home And The Office And How We Manufacture Products And Machines. The Idea Of Connected Devices That Exchange Data, Including Sensitive Personal Information, At All Times Comes With Some Serious Privacy Concerns	• Industry Associations should participate in the ongoing dialogue between EU and India and advocate for policy reforms and foster public-private partnerships. It could promote technological innovation, remove trade barriers, and produce high-quality standards for products and services. Such collaboration could lead to more efficient, accessible, and sustainable smart cities.
BIS-TSDSI-TEC & CEN-CENELEC-ETSI	BIS has developed the IS 18000 Unified Digital Infrastructure – ICT Reference Architecture as an international standard The **Telecommunications Standards Development Society, India** (TSDSI) develops standards for Telecom/ICT products and services in India. They have published a comprehensive set of standards for digital infrastructure in smart cities, and aim to reflect Indian requirements into International Telecom/ICT standards. The **Department of Telecommunications** (DoT) and the **Telecommunication Engineering Centre** (TEC) are instrumental in standardizing digital connectivity policies in India. TEC formulates standards for the telecom and ICT sector, which are used by Telecom Service Providers (TSP).	CEN and CENELEC continue working on breaking down technical barriers that prevent the creation of a single market for energy, the reduction of energy costs and the further deployment of new technologies that can support the energy transition. ETSI is a key player in establishing standards for digital connectivity in EU/EFTA smart cities. As a founding member of 3GPP and oneM2M, ETSI collaborates on standard technology for smart cities. It's part of the International Working Group on IoT-Enabled Smart City Framework. In the ETSI ISG CIM group, an open API called NGSI-LD is being developed for information exchange. Cooperations with various standards bodies are facilitating interoperability with IoT platforms, mobile apps, legacy databases, and linked open data systems.	• Indian and European shall work together on developing and aligning standards for Telecom/ICT products and services, and reflecting Indian requirements into International Telecom/ICT standards. • This collaboration could lead to more efficient, accessible, and sustainable smart cities. • This partnership could work on standardizing digital connectivity policies and formulating standards for the telecom and ICT sector.

APPLI CATIONS	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
BIS & ISO/IEC/JTC1	In India, the **Bureau of Indian Standards** (BIS) and the Smart Cities Mission are working together to develop a set of ICT standards for Smart Cities. These standards, developed by the LITD 28 Smart Infrastructure sectional committee, aim to create a Unified Digital Infrastructure (UDI) across the Smart Cities. BIS participate in relevant TCs at ISO, IEC and JTC1	In the EU, the ISO/IEC 30145-3 standard has been published. This standard provides a comprehensive ICT framework for the operation of a smart city. It's part of the European Commission's efforts to support the digital transformation of cities and communities, in line with the European Green Deal objectives. JTC1, through its Smart Cities Working Group (WG11), is developing key standards such as ISO/IEC 30145-3 for ICT use in smart cities, and ISO 37101 for sustainable development, aiding India in standardizing digital connectivity in smart cities. JTC1 has developed the Smart City Framework Standard (PAS 181) for guidance on smart city projects, the Data Concept Model for Smart Cities (PAS 182) for smart city data interoperability, and is working on the IoT Architectural Framework (IEEE P2413). It also collaborates with ISO, IEC, and ITU for smart city standardization.	• Formulating ICT standards for enhancing Adopting Key Standards: India and the EU can implement ISO/IEC 30145-3 and ISO 37101 for standardized smart city connectivity. • Smart City Frameworks: Leveraging JTC1's PAS 181 provides guidance for successful smart city projects in both India and the EU. • Data Interoperability: Embracing PAS 182 facilitates seamless data exchange in smart city systems for India and the EU. • IoT Architectural Framework: Upon completion, IEEE P2413 by JTC1 can be adopted for effective IoT integration in smart cities. • International Collaboration: Collaborating with ISO, IEC, and ITU ensures globally recognized smart city standards for India and the EU.
ITU 3GPP OneM2M	ITU, 3GPP & oneM2M play a vital role in standardizing digital connectivity in India's smart cities. ITU-T Study Group 20 focuses on international standards for IoT and smart cities, guiding India's digital transformation. Simultaneously, 3GPP submits crucial 5G technologies, like 3GPP 5G-SRIT and 3GPP 5G-RIT, for global approval, essential for smart city infrastructure. TEC leads India's work on the ITU 6G Framework, with contributions from a diverse group including industries, startups, academia, and R&D organizations. DoT is propelling 6G research and development in India, with a Technology Innovation Group set up to develop the vision, mission, and goals for 6G in India. These efforts are pivotal for the development of smart cities in India. The Govt.'s Telecommunication Engineering Centre (TEC) has adopted oneM2M specifications as a national standard post its adoption by TSDSI, fostering collaboration among IoT developers and accelerating innovation in the global market. This move aligns with the 'Digital India' vision, ensuring IoT interoperability and security. Noteworthy oneM2M implementations in India include Mobius, Open-source Architecture Semantic IoT Service-platform project (OASIS), C-DOT Common Service Platform (CCSP), and Eclipse OM2M	The ITU and 3GPP are key in standardizing digital connectivity in EU's smart cities. ITU-T Study Group 20 (SG20) develops international standards for IoT and smart cities. 3GPP is leading the development of 5G standards, crucial for smart city infrastructure. Additionally, the EU has a Joint Task Force with ITU and ISO to coordinate international standardization for smart cities. OneM2M is being used as a holistic interoperability reference for smart cities. The standard is evolving with relevant European policy and technical elements. It is seen as a crucial component in the development of smart and sustainable cities and communities. The EU has also created the European Innovation Partnership on Smart Cities and Communities (EIP SCC), which has established a smart cities stakeholder platform with ESO participation.	• ITU and 3GPP: Adopt global standards for IoT, smart cities, and 5G via ITU and 3GPP platforms. • Joint Task Force: Consider joining the EU, ITU, and ISO Joint Task Force for coordinated standardization. • Best Practices Exchange: Facilitate mutual exchange of smart city project best practices between India and the EU. • Collaborative R&D: Engage in joint research to advance digital connectivity technologies. • Policy Harmonization: Strive for policy harmonization in smart cities for consistent regulations. • The collaboration could lead to more efficient, accessible, and sustainable smart cities by leading work on the ITU 6G Framework, propelling 6G research and development, and facilitating interoperability with various platforms and systems; Experience Sharing: India and the EU exchange insights on implementing the oneM2M standard in smart city projects. • Enhanced Standard Development: Collaborate on refining the oneM2M standard, incorporating unique policy and technical considerations for evolving smart city needs. • IoT Collaboration Boost: Adoption of oneM2M standard encourages greater collaboration between Indian and EU IoT developers for joint development of innovative smart city solutions. • EIP SCC Engagement: India explores participation in the EU's EIP SCC, contributing to and learning from their smart city initiatives.

APPLICA TIONS	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
SMART WASTE MANAGEMENT	The Architecture for Waste Management in Indian Smart Cities (AWMINS) introduces Bigbelly, a smart waste collection system, to address solid waste challenges. Smart bins enhance garbage classification and collection. The E-Waste (Management) Rules, 2022, effective from April 1, 2023, digitize e-waste management for transparency. Despite these efforts, managing municipal solid waste remains a significant challenge due to its large daily generation and associated environmental concerns.	The EU/EFTA's Waste Framework Directive establishes the legal foundation for waste treatment and management, emphasizing a hierarchy of prevention, re-use, recycling, recovery, and disposal. This strategy aligns with the EU's comprehensive waste management approach, "Being Wise with Waste." Over the last five decades, the EU has instituted policies addressing waste management and circularity in various sectors, including agroecosystems, aiming for a comparative analysis with other areas like municipal, industrial, and construction waste.	• Smart Waste Management Initiatives: India and the EU/EFTA have strong smart waste management programs. • Complementary Approaches: India's emphasis on smart bins and e-waste digitization complements the EU's waste hierarchy and circularity policies. Collaborative efforts can facilitate the exchange of best practices, technology sharing, and joint standards development.

ENERGY SECTOR

INDIA

BIS has following technical committees which are developing standards in support of smart grid/meter:

ETD-13: Equipment for Electrical Energy Measurement and Load Control (Smart Meter): ETD 13 is responsible for preparing standards for equipment for electrical energy measurement, tariff - and load control, customer information, payment, local and/or remote data exchange, using electromechanical and/or electronic, technologies for applications ranging from electrical energy generation to residential. The standards may include requirements and test methods to cover mechanical, environmental, electrical, safety, metrology dependability aspects as well as functional requirements and data models.

- IS 15959 (Part 2) : 2016- Data exchange for electricity meter reading, tarif and load control - Companion specification: Part 2 smart meter
- IS 15959 (Part 3) : 2017- Data exchange for electricity meter reading, tariff and load control - Companion specification: Part 3 smart meter (Transformer Operated KWh And KVarh, Class 0.2 S, 0.5 S And 1.0 S)
- IS 16444 (Part 2) : 2017- AC static transformer operated watthour and var - Hour smart meters, class 0.2 S, 0.5 S and 1.0 S: Part 2 specification transformer operated smart meters
- IS 16444 : 2015- AC static direct connected watthour smart meter class 1 and 2 - Specification

ETD 46: Grid Integration: ETD 46 is responsible for preparing standards in the field of Grid Integration comprising of LT (ON Grid, Off Grid and Hybrid with and without storage), HT and EHT for all capacities.

ETD 50: LVDC Power Distribution Systems: ETD 50 is responsible for preparing standards on: LVDC System Requirements, Safety and Installation Guidelines, LVDC products including electrical wiring accessories and Applications, Integration of DC Infrastructure and Non-Traditional Distribution Networks/Microgrids.

LITD 10: Power system Control and associated Communications for promotion of Indian Standards relating to Power system control equipment and systems including EMS (Energy Management System), DMS (Distribution Management System), SCADA (Supervisory Control and Data Acquisition) d) Distribution automation, Smart Grid, tele-protection and associated communications used in planning, operation and maintenance of power systems.

- IS 15953 : 2011- Supervisory control and data acquisition (SCADA) system for power system applications
- IS 16334 : 2015- Power system communications - Interoperability – Guidelines
- IS/IEC/TS 62351 standards series (Part 1 to Part 13 and Part 90 and Part 100): Power Systems Management and Associated Information Exchange — Data and Communications Security

BIS has also published Test Specifications for Li-ion Traction Battery Packs and Systems for EVs. On top of that, the government added Energy Storage Obligation with Renewable Purchase Obligation (RPO) in 2022. The Ministry of Power's revised RPO tariff policy ordered organizations like electricity distribution licensees to ensure that some of its energy usage is from renewable sources. Energy Storage Systems with minimum storage of 1hour will be required for large renewable projects with capacity of 5 MW or more.

Compared to others, IGBC and GRIHA give energy and water high priority. The waste and pollution aspect are ranked last in GRIHA. IGBC gives lowest weight to waste and pollution, and management aspects. Both the IGBC and GRIHA prioritize the environment over economic considerations.

STANDARDIZATION

ENERGY SECTOR

EU/ EFTA

The EU/EFTA has relevant standards in place through its TCs such as few mentioned below:

CEN-CENELEC-ETSI Coordination Group on Smart Grids (CG-SG): The CG-SG advises on European standardization requirements relating to smart electrical grid and multi-commodity smart metering standardization, including interactions between commodity systems (e.g. electricity, gas, heat, water), and assesses ways to address them. This includes interactions with end-users, including consumers/prosumers. Its aim is to promote the deployment of open and interoperable data architectures, based on European and international standards. The scope also includes any standards needed to design, operate and maintain electrical grids securely and efficiently. In the specific area of metering, its scope includes electricity, water, gas and heat/cooling metering devices and systems, and associated architecture.

CLC/TC 57: Power systems management and associated information exchange- It is responsible for developing international standards for power systems control equipment and systems including EMS (Energy Management Systems), SCADA (Supervisory Control And Data Acquisition), distribution automation, teleprotection, and associated information exchange for real-time and non-real-time information, used in the planning, operation and maintenance of power systems.

- EN 62361-2:2013: Power systems management and associated information exchange - Interoperability in the long term
- Part 2: End to end quality codes for supervisory control and data acquisition (SCADA)
- EN 62351 - Cyber Security Series (Part 3 to part 9 and Part 11) for the Smart Grid

  CLC/TC 13: Electrical energy measurement and control: Standardization in the field for metering equipment and systems (using whenever possible IEC standards), including smart metering systems, for electrical energy measurement, tariff- and load control, customer information and payment, for use in power stations, along the network and at energy end users, as well as to prepare international standards for meter test equipment and methods.

- CLC/TS 50586:2019: Open Smart Grid Protocol (OSGP)
- EN 62056-1-0:2015: Electricity metering data exchange - The DLMS/COSEM suite - Part 1-0: Smart metering standardization framework

The Energy Performance of Buildings Directive: Adopted in 2002 (revised in 2018) aims to decarbonize European building stock fully by 2050. The European Green Deal, and the Circular Economy Action Plan as part of it calls for a "Renovation Wave' along with ensuring affordability. The Energy Efficiency Directive requires central governments of the member countries to renovate 3% of the total floor area of buildings owned/occupied. It aims to increase the share of renewable energy in the total energy mix.

EU/EFTA energy label: was introduced in 2021, shifting from A+, A++, A+++, etc. to an A-G scale so that only a few products could receive the "A" rating, making room for more efficient future products. It provides information about a product's energy efficiency with a dark green rating indicating highest efficiency and least CO2 emissions and red rating for vice-versa. The label also displays water usage, noise levels, etc. Products with The European Ecolabel signifies that it has undergone an independent evaluation and determined to satisfy stringent environmental standards, the Energy Saving Trust Recommended logo indicates that the product is among the most efficient, and the Energy star label on office tools is also an indication of the product meeting the EU's efficiency standards.

STANDARDISATION: TRANSPORTATION SECTOR

INDIA

BIS has the following technical committees that are responsible for developing standards related to Electric vehicle safety, charging infrastructure and Intelligent Transport System (ITS)

TED 27 on Electric and Hybrid Vehicles is responsible for standardization of Electric and Hybrid vehicles and their components. It is national mirror technical committee of ISO/ TC 22/SC 37 and IEC/ TC 69. Please click here for the list of standards developed by TED 27.

- IS 17191 (Part 1) : 2019- Electric Power Train Vehicles Part 1 Measurement of Electrical Energy Consumption
- IS 17191 (Part 2) : 2019- Electric Power Train Vehicles Part 2 Method of Measuring the Range

ETD 51 on Electrotechnology in mobility is responsible for standardization of electrotechnical aspects of totally or partly electrically propelled road vehicles. Click here for the list of standards published by ETD 51.

- IS/ISO-15118 series: Road vehicles - Vehicle to grid communication interface
- IS 17017 series: Electric Vehicle Conductive Charging System
- IS 17896 (Part 1&2): Electric vehicle battery swap system

TED 28 on Intelligent Transport Systems: is responsible for Standardization of information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects thereof, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services in the intelligent transport systems, Co-ordination of work with ISO/TC 204 excluded in-vehicle transport information and control systems (ISO/TC 22) and ISO/TC 241

- IS/ISO/TR 12859 : 2009- Intelligent transport systems - System architecture - Privacy aspects in its standards and systems
- IS 16722 : 2018 - Radio Frequency Identification (RFID) System for Automotive Applications Specification
- IS 16833 : 2018 - Automotive Tracking Device (ATD) and Integrated Systems
- IS/ISO 39001 : 2012- Road traffic safety (Rts) management systems - Requirements with guidance for use

Emissions Standards: In India, these are called the Bharat Stage emissions standards (BSES) were introduced in 2000 following Supreme Court's order. These standards were directly taken from Euro norms that prevailed then. Currently BS VI norms are applicable in India on all new cars sold and registered after 1st April 2020. ARAI and Ministry of Road and Transport works on creating CMVRs & AIS standards for testing and certifications while aligning them with UN WP29.

CAFÉ Standards: Automotive manufacturers in India need to ensure that the per kilometer emissions of a particular fleet of their vehicle must be below the set standards. The benchmark is established using the kerb weight of the average fleet.

STANDARDIZATION

STANDARDISATION: TRANSPORTATION SECTOR

EU/ EFTA

In EU/EFTA has through European Standards Organization CEN-CENELEC-ETSI standards are developed through following TCs:

CENELEC: TC 69X: Electrical systems for electric road vehicles: TC 69X is responsible to prepare European standards related to electrical systems for road vehicles, totally or partly propelled from self-contained power sources.

- EN 61851 series: Electric vehicle conductive charging system
- EN IEC 62840-2:2019- Electric vehicle battery swap system - Part 2: Safety requirements
- EN IEC 63119 (Part 1&2): Information exchange for electric vehicle charging roaming service

CLC/TC 23BX: Switches, boxes and enclosures for household & similar purposes, plugs & socket outlets for d.c & for the charging of electrical vehicles including their connectors.

CEN/TC 278 'Intelligent Transport Systems': Standardization in the field of intelligent transport systems, encompassing services and techniques to achieve road safety, environmental sustainability and traffic efficiency, and to improve the travel experience; applying information and communication technologies between vehicles/infrastructure/other road users. It included: aspects of cooperation (C-ITS); intermodality and multimodality; traffic management; mobility information; mobility integration; mobility as a service; systems and services for vulnerable road users; ITS services for automated vehicles; parking management; user fee collection; public transport management; eCall; after-theft vehicle recovery systems; kerbside and pavement management. Mobility accessibility for all users is an important aspect of ITS standardization.

- CEN ISO/TR 21186 (Part 1 to 3): Cooperative intelligent transport systems (C-ITS) - Guidelines on the usage of standards
- EN ISO 24978:2009: Intelligent transport systems - ITS Safety and emergency messages using any available wireless media - Data registry procedures (ISO 24978:2009)
- EN ISO 21177:2023: Intelligent transport systems - ITS station security services for secure session establishment and authentication between trusted devices (ISO 21177:2023)
- EN 16072:2022: Intelligent transport systems - ESafety - Pan-European eCall operating requirements

EU also has the ETSI TC ITS is responsible for standardization to support the development and implementation of Intelligent Transport Systems (ITS) service provision across the network, for transport networks, vehicles and transport users, including interface aspects, multiple modes of transport and interoperability between systems.

- ETSI TS 103 918 V2.1.1 (2023-11): Intelligent Transport Systems (ITS); Security; Testing; ITS Misbehaviour Reporting; Interoperability tests specification; Release 2
- ETSI TS 103 900 V2.1.1 (2023-11): Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Cooperative Awareness Service; Release 2

Emission related technical regulation are also aligned with UN WP29

Digital connectivity is a fundamental pillar of smart cities, serving as the conduit for a wide array of services and applications aimed at enhancing the quality of life for residents. However, achieving seamless digital connectivity is not without its challenges. From application-based services to smart water management, smart meter policy, public safety and surveillance, and data analytics and urban planning, each facet presents unique hurdles that must be overcome. These challenges underscore the complexity of building digitally connected urban environments and highlight the need for comprehensive strategies and solutions. The journey towards fully connected smart cities is a challenging yet rewarding endeavour, promising unprecedented opportunities for urban development and citizen empowerment. Mentioned below are some of the gaps and challenges along with their recommendations:

GAPS & RECOMMENDATIONS: DIGITAL SECTOR			
APPLICATION BASED	INDIA	EU/EFTA	INDIA-EU/EFTA RECOMMENDATION
SMART WASTE MANAGEMENT	• **Swachh Bharat Abhiyan:** Launched in 2014; National initiative for a clean and open defecation-free India. **Challenges:** insufficient funding, infrastructure limitations, limited public engagement. • **Waste-to-Energy Policy:** Promotes waste utilization for energy generation. **Challenges**: high capital costs, lack of citizen awareness, environmental pollution concerns. **Recommendations:** Collaborate with the EU to adopt and implement the EU Waste Management Directive, which could help address challenges in the Swachh Bharat Abhiyan and Waste-to-Energy Policy.	• **SWAMP Project:** Reduces software development effort for IoT-based smart apps; Automates advanced platforms and tech integration. • **EU Waste Management Directive:** Establishes the legal foundation for EU waste management; Focuses on waste hierarchy, recycling targets, and landfill diversion. **Challenges:** Inconsistent implementation due to differences in waste generation, resources, and regulations. • **CityLoops Project:** Aims to transform urban areas into circular cities; Showcases innovative waste management and circular economy approaches. **Challenges:** In scaling solutions across diverse EU cities with varying waste profiles and infrastructures. **Recommendations:** Leverage SWAMP Project to automate tech integration in the CityLoops Project, aiding in scaling solutions across diverse EU/EFTA cities.	• India and EU share mutual benefits in waste management initiatives. • Swachh Bharat Abhiyan aligns with the EU's Horizon 2020 Project - CityLoops. • Focus on sustainable waste management and behavioral change. • Similar goals in reducing waste with challenges like high costs and low awareness hence an opportunity for collaboration.
SMART WATER MANAGEMENT	• **AMRUT 2.0 Vision:** Strives for 'Water Secure Cities' through urban water and wastewater management; Ministry of Urban Development identifies 24 key 'smart cities.' **Challenges** include a lack of comprehensive understanding and development strategies for water sector advancement. **Recommendations:** India can take insights from EU's **Water Framework Directive**, **Urban Waste Water Directive** and **Horizon 2020 Framework** to focus on better water protection, management and efficiency.	• **Smart Water Management:** State and local levels develop smart water management policies; European directive aims for good status of waters, but aging pipelines pose challenges **Challenges** to SWM implementation: lack of customer support, weak cost–benefit analysis, expertise, and supporting policies. • Lack of coherent national-level water management policy • Absence of strong water policies and political support for Smart Water Metering (SWM). **Recommendations:** EU/EFTA can take insights from India's **AMRUT Mission** and **Smart Cities Plan** to reduce water losses, improve urban water management.	• Both regions face challenges such as incoherent national-level policies, aging infrastructure, lack of customer support, and weak cost–benefit analysis. • This collaboration could lead to improved water management practices, increased public awareness, and more sustainable cities.

(Contd...) GAPS & RECOMMENDATIONS: DIGITAL SECTOR			
APPLICATION BASED	**INDIA**	**EU/EFTA**	**INDIA-EU/EFTA RECOMMENDATION**
PUBLIC SAFETY SURVEILLANCE	• Growing demand for safe city projects in India, focusing on public safety. • Successful deployment of surveillance and smart city projects, utilizing video surveillance and central control rooms. • The Smart Cities Mission (SCM) was launched in 2015 to enhance life in 100 Indian cities and towns. Surveillance investments have been made, but progress is uneven due to administrative, financial, and technology-related challenges. • Increasing adoption of biometric surveillance for facial recognition in public places. • **Challenges** include data privacy and security concerns. • Biometric surveillance raises privacy and data protection concerns. **Recommendations:** India can collaborate with EU by leveraging EU's experience in security management, cybersecurity, Privacy and risk estimation.	• Cities employ various technologies for public safety: facial recognition, biometrics, police cameras, drones, and crowdsourcing. • OEM's initiative uses LTE technology and IoT for urban public security. • Risk-based security, cybersecurity, behavior tracking, risk estimation, and crisis management. • Smart cities pose political, technical, and socioeconomic challenges due to their complex and interconnected nature. • Video surveillance faces issues: inefficiency, blind spots, and low-quality imagery. • Data-related challenges: storage, retrieval, delays in incident reporting, and data loss. • Aims to enhance city infrastructures, ICT systems, and security in smart spaces, improve public safety and surveillance using digital grids and data-driven solutions for safer urban environments. • **Challenges** related to data processing and management. **Recommendations:** India's advancements in smart city projects could guide EU's efforts to enhance urban resilience.	• India and the EU/EFTA jointly work on Safe City Projects and S4AllCities. • Sharing insights on public safety, surveillance, and smart city projects. • Collaborating to address data privacy, security, and management issues in biometric surveillance.
DATA ANALYTICS AND URBAN PLANNING	• SCM launched in 2015 to enhance life in 100 Indian cities, It explores Big Data for data-driven smart city services and crucial applications. • The complex nature of smart cities poses political, technical, and socioeconomic challenges. • The project examines GIS's role in Indian smart city urban planning. • Rapid urbanization in India demands effective governance with high-quality, timely data. • **Challenges** include facing uneven progress due to administrative, financial, and technology. **Recommendations:** The EU/EFTA's expertise in urban data platforms could benefit India's smart cities mission, data analytics and Urban Planning	• Smart Cities & Urban Mobility seeks sustainable solutions using AI, encompassing energy, water, waste, and pollution. • Aims to provide urban data platforms to 300 million Europeans by 2025. • Urban Data Platforms (UDPs) integrate data using interoperable standards, with 70% of cities adopting these standards. • Building trust between private and public sectors is vital for effective data utilization; Urban Computing's role is analyzed in strategic, short-term, and joined-up planning for data-driven, sustainable cities. • Recognizes the complexity of sustainable cities due to unpredictability, contestations, conflicts, and contingencies in decision-making. **Challenges** include digital transformation obstacles and key issues regarding technology, data reliability, third-party reliance, skills, ethical AI, and complex regulation. **Recommendations:** India's use of big data to solve urban issues could guide EU's strategies for sustainable and inclusive cities.	• India-EU/EFTA collaboration on Big Data Analytics in Smart Cities. • Sharing insights and experiences in data analytics for smart city services. • Exchanging insights on urban data platforms and integration with city systems. • Jointly addressing data challenges in smart city projects. • Collaborating for data-driven governance and urban planning through urban computing and intelligence..

GAPS, CHALLENGES & RECOMMENDATIONS

Smart City- Dig

(Contd...) GAPS & RECOMMENDATIONS: DIGITAL SECTOR			
APPLICATION BASED	**INDIA**	**EU/EFTA**	**INDIA-EU/EFTA RECOMMENDATION**
SMART METER LIGHTING	• **India's Smart Meter Rollout:** Government targets 250 million smart meters by 2025. • **Challenges** include consumer acceptance and skills gap, but EESL and states are driving developments. • Power companies like Adani Energy Solutions, Tata Power, and Torrent Power are actively implementing smart metering projects. • Rapid adoption with numerous companies securing orders and announcing plans. • Anticipated challenges for these companies involve operational efficiency and grid balancing. **Recommendations:** Learning from EU/EFTA's 50%+ smart meter penetration for India's 250 million target.	• Endesa started deploying smart meters with 40% coverage in 2019, funded by the European Investment Bank. • **Challenges** in integration and communication with various smart meters, data concentrators, and Head End Systems (HES). • European Commission's report on smart metering progress. Targets include 200 million smart electricity meters and 45 million gas meters by 2020, with a potential €45 billion investment. Challenges related to Member States' criteria, regulations, interoperability, data privacy, and security. • Over 50% of European electricity meters are now smart, driven by increased investments in grid modernization. **Recommendations:** India's experience overcoming resistance can benefit EU/EFTA's lagging states.	• India and the EU/EFTA could collaborate on projects like smart meter rollouts by EESL and Endesa, exchanging insights on consumer acceptance, integration, and financing. • Knowledge exchange on consumer acceptance, integration, and financing models. • Jointly addressing challenges faced by power companies (e.g., Adani Energy Solutions, Tata Power, Torrent Power) in smart metering. • Collaboration extends to addressing gaps in data analytics and urban planning in smart cities.

GAPS & RECOMMENDATIONS: ENERGY			
APPLICATION BASED	**INDIA**	**EU/EFTA**	**INDIA-EU/EFTA**
SMART GRIDS AND ENERGY MANAGEMENT	• National Smart Grid Mission aims to modernize the electricity grid by integrating advanced technologies for real-time monitoring, better load management, and reduced losses. • Policies such as time-of-day pricing and demand response programs have been introduced to incentivize consumers to shift their energy consumption to off-peak hours.	• SET Plan (Strategic Energy Technology Plan) promoting research and innovation in smart grids. • EU/EFTA's Clean Energy for All Europeans Package supports the development of smart grids and intelligent energy management systems for enhancing the flexibility and reliability of the energy system. • In countries like Germany, smart grid initiatives integrate renewable energy sources and enable more efficient demand-side management.	• Cross-Border Interoperability: Encourage standardization and interoperability of smart grid technologies across borders to facilitate the seamless exchange of energy data and resources between neighboring regions. • Community Engagement Programs: Implement community-based programs to raise awareness about smart grids, involving citizens in demand-side management and promoting energy conservation practices. • Investment in Resilience: Invest in resilient smart grid infrastructure to withstand cybersecurity threats and natural disasters, ensuring uninterrupted energy supply in cities. • Continued collaboration and exchange for interoperability of standards
RENEWABLE ENERGY INTEGRATION	• India's National Action Plan on Climate Change includes the National Solar Mission with a target of 20,000 MW of grid connected solar power. • Policies like Renewable Purchase Obligations (RPOs) mandate a certain percentage of energy consumption from renewable sources, encouraging the integration of renewable energy into the grid.	• Renewable Energy Directive: A latest target of 42.5% renewable energy in grids is set for 2030. • Feed-in Tariffs and premium schemes in various EU/EFTA countries provide financial incentives for renewable energy producers, promoting the growth of wind, solar, and other clean energy sources.	• Incentives for Distributed Energy Resources (DERs): Provide financial incentives and regulatory support for the integration of distributed energy resources, such as residential solar panels and community-based renewable projects. • Smart Contracts and Blockchain: Explore the use of smart contracts and blockchain technology to enable transparent and automated transactions in the renewable energy market, fostering trust among producers and consumers. • Flexibility Mechanisms: Develop flexibility mechanisms, such as energy storage and demand response programs, to balance the intermittency of renewable sources and enhance the reliability of the energy grid.
ENERGY EFFICIENT BUILDINGS	• BEE's Energy Conservation Building Code (ECBC): Measures and rates buildings based on its energy performance while taking into consideration parameters like climatic region. • Incentives, such as tax breaks and faster approvals, are provided for builders and developers incorporating energy-efficient technologies in their projects. • Strengthened and further existing ratings like GRIHA and LEED	• EU/EFTA's Energy Performance of Buildings Directive, which sets out the minimum energy performance requirements for new and existing buildings, promoting energy efficiency in the building sector. • Many EU/EFTA countries have implemented programs like the Green Building Council's certification systems to recognize and promote energy-efficient building practices.	• Leveraging Internet of Things (IoT): Encourage the integration of IoT devices for real-time monitoring and control of energy consumption in buildings, enabling adaptive energy management systems. • Green Financing Schemes: Introduce and promote green financing schemes that offer favorable terms for developers and homeowners investing in energy-efficient building technologies. • Public Awareness Campaigns: Launch campaigns to raise awareness among citizens about the long-term benefits of energy-efficient buildings, emphasizing comfort, cost savings, and environmental sustainability.

GAPS & RECOMMENDATIONS: TRANSPORT			
APPLICATION BASED	**INDIA**	**EU/EFTA**	**INDIA-EU/EFTA**
SMART PARKING SYSTEM	• Strengthened the Smart Cities Mission in India, which has initiated projects for smart parking systems in various cities. For example, the city of Pune has implemented a mobile app-based parking system to provide real-time information on parking availability and facilitate cashless transactions. • Further encouraging the integration of digital payment systems to promote cashless transactions and reduce congestion around parking areas.	• The EU/EFTA has been promoting sustainable urban mobility through initiatives like the Green Deal, which emphasizes the reduction of emissions and the use of digital technologies for efficient urban transport. • Various cities in the EU/EFTA, such as Amsterdam and Barcelona, have implemented smart parking solutions that utilize sensor technologies to guide drivers to available parking spaces, reducing traffic congestion.	• Dynamic Pricing Models: Implement dynamic pricing for parking spaces based on demand, time of day, and events to optimize usage and reduce congestion during peak hours. • Integration of Multi-Modal Transportation: Encourage seamless integration between parking systems and other modes of transportation, such as public transit and vehicle-sharing, to provide citizens with a holistic mobility experience. • Data Privacy and Security Measures: Strengthen data privacy and security measures to ensure that user information in smart parking systems is protected from unauthorized access.
TRAFFIC MANAGEMENT AND OPTIMIZATION	• The Intelligent Traffic Management System (ITMS) must be implemented in various Indian cities under the Smart Cities Mission. This involves the use of technologies like adaptive traffic signal control systems to optimize traffic flow. • Policies in India must be focused on the development of dedicated lanes for buses and the promotion of non-motorized transport to reduce traffic congestion.	• The EU/EFTA has been investing in Intelligent Transport Systems (ITS) to improve traffic management. Cities like Copenhagen have implemented smart traffic lights that prioritize public transport and cyclists, reducing overall congestion while discouraging private vehicles on the road. • Learn from policies implemented elsewhere like congestion pricing to discourage private vehicle use during peak hours, thereby reducing traffic and emissions.	• Real-time Traffic Information: Enhance the availability of real-time traffic information to citizens through mobile apps and digital displays to enable informed decision-making on route choices. • Collaboration with Private Sector: Encourage partnerships with private companies for the development of innovative traffic management solutions, such as predictive analytics for traffic patterns. • Public Awareness Campaigns: Conduct public awareness campaigns to educate citizens about the benefits of using public transport and alternatives to private vehicle use.
ELECTRIC AND SUSTAINABLE MOBILITY	• Boost to the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme in India, which provides incentives for the adoption of electric vehicles (EVs). Cities like Delhi have implemented electric buses to reduce air pollution. • Incentives for EV charging infrastructure development are being provided to promote the growth of electric mobility. • Expansion of Vehicle Scrappage Policy and Infrastructure development for these scrapped vehicles with incentives.	• The EU/EFTA has set ambitious targets for reducing CO2 emissions from transport, with a focus on promoting electric mobility. Incentives for EV purchases, along with stringent emissions standards, should be furthered.. • Promotion fo more and more non-motorized transport infrastructure: Many European cities, including Amsterdam and Oslo, have developed comprehensive cycling infrastructure and pedestrian-friendly zones to reduce dependence on motorized transport.	• Charging Infrastructure Expansion: Accelerate the expansion of EV charging infrastructure in both urban and peri-urban areas to alleviate range anxiety and encourage widespread adoption of electric vehicles. • Incentives for Sustainable Modes like alternative sustainable modes of transport, such as cycling and walking, to promote healthier and environmentally friendly commuting options. • Public-Private Partnerships: Foster public-private partnerships to develop and maintain sustainable mobility infrastructure, ensuring the involvement of both government bodies and private enterprises in building a comprehensive and accessible transportation network. • Uniform global standards for charging infrastructure, combined research on energy storage

DATA PRIVACY & CYBERSECURITY

INTRODUCTION

In the era of digital revolution, cybersecurity and data privacy have emerged as critical concerns, given the substantial increase in the gathering and storage of personal information in various aspects of our digital lives, including internet surfing history, financial details, and medical records. The continuous evolution of cyber threats, such as data breaches, malware attacks, and phishing scams, underscores the need for robust cybersecurity measures.

Beyond being technological considerations, data privacy and cybersecurity hold significance for human rights and business imperatives. Safeguarding personal information is essential for upholding individuals' freedom, privacy, and dignity. Public trust in digital technologies, the promotion of innovation, and the protection of critical infrastructure all hinge on effective cybersecurity practices.

In addressing the complexities of cybersecurity and data privacy, India and the EU/EFTA have established distinct policy frameworks, reflecting their governance systems and socioeconomic environments. India's "Digital Personal Data Protection Bill" outlines individuals' rights over their data and regulates the processing of personal information. Conversely, the EU/EFTA's General Data Protection Regulation (GDPR) empowers individuals with greater control over their personal data and sets stringent guidelines for data protection. Recognizing the transnational nature of cyber threats, both India and the EU advocate for international cooperation to effectively address these challenges.

SECTOR PROFILE: TIMELINES

2000 — The first India-EU Summit

Joint Vision Statement for promoting Cooperation in Information & Communications Technology, bilateral agreements & MoUs, notably a Science & Technology Agreement — **2001**

2001 — Memorandum of Understanding (MoU) on cooperation in the field of information security

2003 — 4th India-EU Summit in New Delhi mentioning cybersecurity as a subject of bilateral discussions for the first time.

Adaption of Joint Action Plan on Information Security — **2005**

2006 — Security Dialogue envisaged under the Joint Action Plan

Joint Declaration in the field of Education & Training , Cybercrime Project — **2008**

2011 — 1st meeting for Foreign Policy Consultations

Joint Declaration on Research & Innovation Cooperation, first Ministerial Dialogue on Cybersecurity, Joint ICT Working Group on Cybersecurity — **2012**

2013 — launched the Cyber Security and Data Protection Dialogue.

Signed a Joint Declaration on Cybersecurity, Launch of Cyber Dialogue, Launch of Cyber Security Capacity Building Project. — **2016**

2017 — Launch of Data Protection Cooperation Project.

Launch of Cyber4Trust project. — **2018**

2020 — India-EU Joint Working Group on Artificial Intelligence

Launch of Cyber Diplomacy Dialogue, Cybersecurity for Critical Infrastructure Project in India — **2021**

2022 — first Trade and Technology Council meeting, Cybersecurity Project to strengthen healthcare sector in India (Ayushman Bharat)

India-EU Joint Statement on Cybersecurity was adopted to Strengthens cooperation against cybercrime. — **2023**
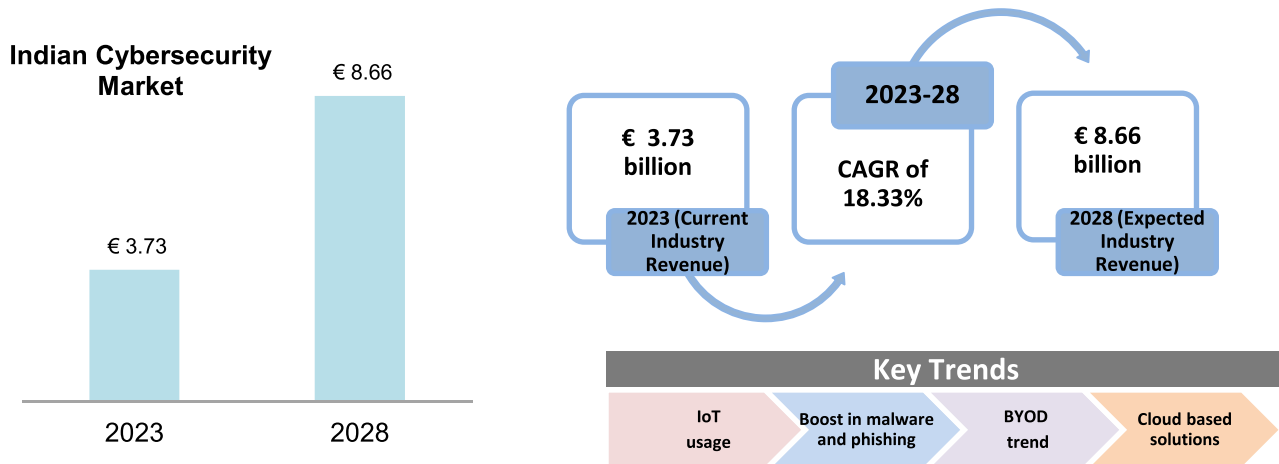
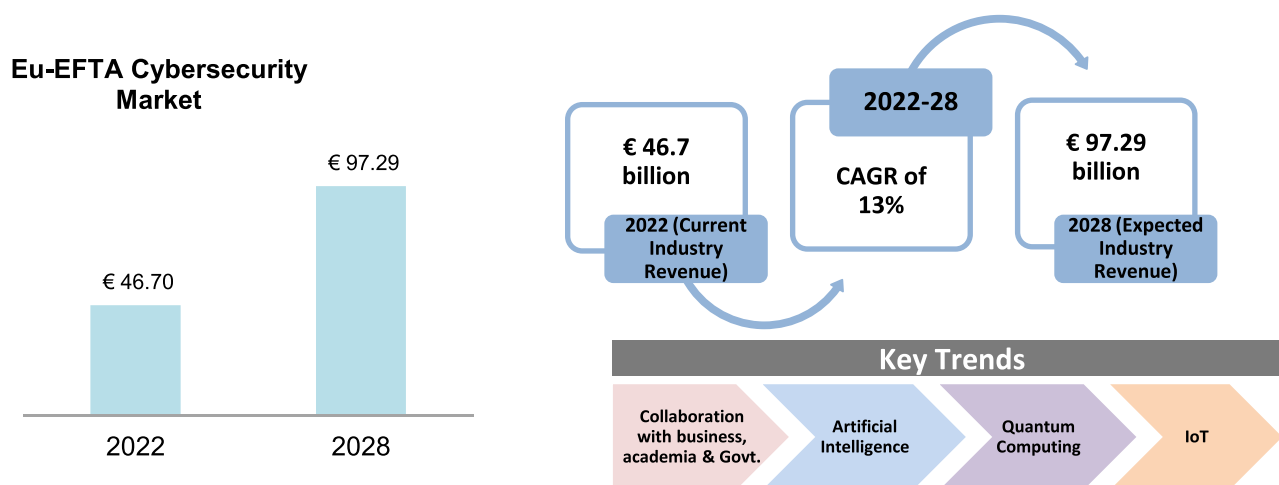# SECTOR PROFILE: MARKET DYNAMICS

INDIA CYBERSECURITY MARKET

The demand for digitalization and scalable IT infrastructure is increasing, with risks posed by third-party vendors, MSSPs, and cloud-first strategies.

Indian Cybersecurity Market

€ 8.66

€ 3.73

2023 | 2028

€ 3.73 billion — 2023 (Current Industry Revenue)

2023-28 — CAGR of 18.33%

€ 8.66 billion — 2028 (Expected Industry Revenue)

Key Trends

| IoT usage | Boost in malware and phishing | BYOD trend | Cloud based solutions |

Market expansion is predicted due to rising mobile device usage, secure authentication, and changes in antivirus software. The Indian government prioritizes cyber security, creating task teams and collaboration. However, India has started enacting comprehensive data protection legislation and rules are getting framed for it's implementation. India's strategic approach aligns with its goal of a € 0.94 trillion digital economy by 2025.

EU/EFTA CYBERSECURITY MARKET

Europe, a global trade hub, faces complex cyber security threats like state-sponsored attacks, cybercrime, and hacktivism, impacting sectors like healthcare, financial services, and infrastructure.

Eu-EFTA Cybersecurity Market

€ 97.29

€ 46.70

2022 | 2028

€ 46.7 billion — 2022 (Current Industry Revenue)

2022-28 — CAGR of 13%

€ 97.29 billion — 2028 (Expected Industry Revenue)

Key Trends

| Collaboration with business, academia & Govt. | Artificial Intelligence | Quantum Computing | IoT |

Investing in cybersecurity solutions offers economic benefits like asset protection, increased customer trust, and competitiveness. The skilled labor force supports cybersecurity solutions implementation, leading to market expansion regulated by GDPR and NIS Directive.

In a time of increasing digital connectivity, the prospects for cybersecurity and data privacy policies in the EU/EFTA and India are rising to the forefront of discussion worldwide. As the digital landscape develops, countries are realizing more and more how important it is to strengthen their cyber defense and protect confidential data. With their developing technical sectors and advantageous geographic locations, EU/EFTA and India are positioned to have a significant impact on how cybersecurity and data privacy laws develop in the future. In light of this, the plans and joint initiatives between both nations might strengthen their respective cybersecurity frameworks while also influencing worldwide standards and fostering a more secure and robust global digital economy.

CYBER SECURITY & DATA PRIVACY			
POLICY	INDIA	EU/EFTA	RECOMMENDATIONS
DATA ENCRYPTION STANDARDS	• Indian parliament has passed **Digital Personal Data Protection Bill while the rules and timelines are under formulation at MeiTY** • It aims to regulate the collection, use, storage, and transfer of personal data. • TSDSI and TEC have collaborated on various initiatives to promote **Quantum computing research and development** in India. Work has also started on QKD. BIS is also handling Quantum Technologies Standardization with ISO/IEC • They lack in funds, skill, knowledge and infrastructure.	• Implementation of quantum-resistant encryption algorithms by governments and organizations. • Protecting data from potential quantum computer attacks. • Quantum computers, though in early development, pose a future encryption threat. • European Network and Information Security Agency (ENISA) has identified several gaps in **Quantum key distribution (QKD)** standards. • ETSI has standardization work ongoing around QKD • CEN-CENELEC also working on Quantum Technologies Standardization activities with ISO/IEC	• India's early-stage cybersecurity laws could benefit from EU/EFTA experience • EU/EFTA expertise could assist in developing national-level policies • Facilitating policies could boost investment in India's cybersecurity sector, including from the EU/EFTA. • EU/EFTA might provide a thorough framework for standardizing QKD and sophisticated security testing techniques for QKD systems. They might also put more emphasis on QKD system physical security. • India and the EU/EFTA may work together on standards and guidelines as well as best practices for defending QKD systems against physical assaults. Creating policies for incident response protocols, physical security measures, and secure location selection are all included in this.
SECURE AUTHENTICATION FRAMEWORKS	• Significant opportunity for secure authentication frameworks in India. • Driven by factors such as the growing digital economy and government regulations like **National Cybersecurity Policy, Cybersecurity Framework, Cybersecurity Strategy, National e-Governance Plan (NeGP), Digital India Program, Aadhaar (Unique Identification Number), Data Privacy Bill** • Emphasis on authenticating human users in digital transactions. • Achieved through environmental and behavioral analysis.	• **EU's NIS 2 Directive**: Tighter cybersecurity rules, including secure authentication. • "Trusted Identity" initiative promotes secure authentication for EU's digital security.	• Enhance credit card payment acceptance through 3D secure pay authentication. • Develop a digital ID wallet considering customer preferences and identification factors • Collaborate on a new framework for eIDAS and digital ID wallet. • Facilitate growth in the cybersecurity market through national policies and regulations.

(Contd...) CYBER SECURITY & DATA PRIVACY			
POLICY	**INDIA**	**EU/EFTA**	**RECOMMENDATIONS**
CONSENT MANAGEMENT FRAMEWORKS	• India's data-driven economy and data protection laws • Opportunities for Consent Management Frameworks • Secure user consent for data collection, storage, and management • Consulting services for compliant processes and data sharing solutions • Focus on critical sectors like healthcare and education • Raising awareness about Consent Management Frameworks • Advocating data rights and preferences among users and stakeholders	• European Commission's **"Trusted Identity"** initiative promotes Common Mobile Financial Services (CMFs). • Aims to enhance the digital experience for European citizens and businesses. • Emphasizes secure and seamless technology use. • Implementation of consent management as the part of **GDPR** law.	• India could gain cybersecurity expertise by partnering with EU/EFTA universities connect • Development of advanced cybersecurity courses in India • EU/EFTA is a global player in the cybersecurity market with high demand for Cyber Threat Management (CMFs). • Encourage EU/EFTA's SME/MSME to enter India, especially in consent management framework to work with India's SME/MSME.
IDENTITY PROTECTION PROTOCOL	• Unverified users pose a security threat • Biometric factors (voice, iris, gait, heartbeat) to enhance **KYC** in 5 years to improve security and user experience	• **European Digital Identity** (eID) system for EU /EFTA citizens • Single digital identity for public and private services • Reduces identity theft risk	• Machine learning and artificial intelligence (AI) will play a pivotal role in the future of document verification. • India & EU/EFTA shall work together on creating strong, secure and most advanced digital identity using AI/MI
CROSS-BORDER DATA TRANSFER STANDARDS	• Enacted Digital Personal Data Protection Bill 2023: Focuses on company data handling cross border data transfer. • The bill covers both domestic and cross-border data transfers. • If personal data is transferred outside India without the consent of the data principal the data fiduciary may be subject to a penalty of up to 4% of its global turnover. • If personal data is transferred within India without the consent of the data principal the data fiduciary may be subject to a penalty of up to 2% of its global turnover.	• The **General Data Protection Regulation (GDPR)** is a regulation in EU/EFTA law on data protection and privacy in the European Union (EU/EFTA) and the European Economic Area (EEA) • Interoperable Cross-border data transfer standards & law boost trade and investment • Trust in data protection encourages investment and trade with EU/EFTA businesses • Fosters economic growth and job creation	• India and EU/EFTA could establish cross-border data transfer agreements in digital trade • Interoperable Standards, compliance, secure transfers, transparency, user data accountability are important & possible area of collaboration. • Benefits include coordinated enforcement actions, violation information sharing, joint investigations

SECTOR PROFILE: CURRENT STATE & FUTURE POTENTIAL

(Contd...) CYBER SECURITY & DATA PRIVACY			
POLICY	**INDIA**	**EU/EFTA**	**RECOMMENDATIONS**
DATA PROTECTION CERTIFICATION	• According to the **DPDP Bill**, certain businesses, referred to as "significant data fiduciaries" (SDFs), are required to get data protection certification from the DPB. • Additionally, it is anticipated that the measure will foster innovation in the data security sector and open up new markets for companies offering data security services and goods.	• **ENISA** provides support to national and European authorities in developing their own data protection certification schemes. • ENISA works to promote and facilitate the development of data protection certification schemes that can help organizations demonstrate their compliance with the General Data Protection Regulation (GDPR).	• India and EU/EFTA collaboration on a common data protection certification scheme; India can learn from ENISA's experience in this area by developing its own mutual recognition agreements (MRAs) with other countries. • Certification for organizations meeting standards in both jurisdictions • Promotes cross-border business and privacy safeguards • Enables training and capacity building for compliance • Facilitates effective operations and privacy protection for citizens in both countries
PRIVACY IMPACT ASSESSMENTS (PIAS)	• For India's potential privacy issues to be successfully identified, evaluated, and mitigated, DPO participation in the PIA process is crucial. Their independence, impartiality, and experience all play a vital part in boosting PIA's efficacy and defending people's right to privacy.	• The General Data Protection Regulation (GDPR) of the European Union has established a rigorous benchmark for data protection measures, and the forthcoming Data Governance Act is anticipated to further enhance the legal framework. PIA is essential to an organization's ability to meet these strict criteria.	• Enhancing the consistency and effectiveness of PIA practices among various businesses can be achieved through the creation of standardized and industry-specific PIA methods. To automate risk detection and assessment and empower enterprises to proactively address privacy problems, PIA should be connected with AI and data analytics tools.
DATA BREACH RESPONSE PLANS	• Indian authorities, including **CERT-In**, plan to enhance data breach laws in 2023, aligning with EU/EFTA standards to strengthen India's cybersecurity.	• EU/EFTA may enhance data and financial security measures. • Implement robust data breach response plans. • Swift breach mitigation to safeguard customers and reputation. • Governments with online services (e.g., tax filing, passport applications) can use these plans for enhanced security against unauthorized access.	• India and EU/EFTS could establish legal counsel to EU/EFTA guide government departments in breach management and defence against claims arising from the incident.

Government's role in protecting data privacy and cyber security is changing. Governments will need to modify their policies and activities as the threat landscape continues to shift. However, the core tenets of data privacy and cyber security remain the same businesses must put in place the proper security measures to safeguard their systems and data, and individuals must be aware of the dangers and take precautions to safeguard their own privacy. India experienced a 11.8% increase in cybercrime in 2020, with over 1.15 million incidents reported to CERT-In. In 2021, India ranked third globally in data breaches, with 86.3 million incidents. The EU/EFTA also experienced a surge in ransomware, mobile malware, and online fraud, with ransom payments rising over 300% from 2019 to 2020.

Some of the relevant policy names are mentioned as below:

GEOGRAPHY	POLICY NAME	POLICY DESCRIPTION
India	**National Cyber Security Policy (2013)**	The National Cyber Security Policy 2013 aims at facilitating the creation of secure computing environment, enabling adequate trust and confidence in electronic transactions and guiding stakeholders actions for the protection of cyberspace.
	Cyber Swachta Kendra (2017)	Cyber Swachhta Kendra (CSK) is a platform that was launched in 2017 to help internet users clean their computers and devices of viruses.
	RBI Act (2018)	The RBI Act of 2018 aims to create standards that equalize security frameworks of banks and payment operators according to how they adapt to new technologies and digitalization.
	National Digital Health Mission (2020)	The mission's goal is to create an integrated healthcare system that connects patients and practitioners digitally.
	National Cyber Security Strategy (2020)	The National Cyber Security Strategy (NCSS) 2020 was created by the Data Security Council of India (DSCI) to ensure a safe, secure, trusted, resilient, and vibrant cyberspace for India.
	Digital India Act (2023)	The Digital India Act of 2023 is a new law that covers topics such as: Cybercrime, Data protection, Deepfakes, Competition issues among internet platforms, Online safety (Under formulation)
	Digital Personal Data Protection Bill (2023)	The Digital Personal Data Protection Bill (DPDP Bill) of 2023 regulates the processing of digital personal data in India.
EU/EFFTA	**ENCS Program (2016)**	The program develops and shares knowledge between security officers. ENCS has organized its knowledge development in policy, architecture, and operations.
	ENISA Cybersecurity Certification Scheme (2017)	ENISA develops cybersecurity certification schemes to increase trust in digital products, services, and processes.
	Cyber Security Act (2019)	The CSA's main objective is to improve protection against cybersecurity threats within the EU/EFTA.
	NIS2 (2020)	The NIS2 Directive aims to protect critical organizations and infrastructure within the from cyber threats across the EU/EFTA.
	Cyber Solidarity Act (2021)	The European Commission introduced a proposal for a Cyber Solidarity Act, in an effort to improve the preparedness, detection and response to cybersecurity incidents across the EU/EFTA.
	Cyber Resilience Act (2022)	The Cyber Resilience Act was introduced by the European Parliament in September 2022. Its purpose is to establish cybersecurity requirements for devices and software marketed in the EU/EFTA.

POLICY NAME		POLICY DESCRIPTION
INDIA-EU/EFTA POLICIES COLLABORATION	**EU-India Think Tank Twinning Initiative (2018)**	Initiative to promote joint research on cybersecurity issues.
	NCL & ENISA MoU (2018)	Memorandum of Understanding (MoU) between NCL and ENISA to foster collaboration on cybersecurity standardization and capacity building.
	Cybersecurity Partnership Framework (2020)	A set out a roadmap for future cooperation.
	Trade and Technology Council (TTC) (2022)	India and the EU/EFTA established the EU-India Trade and Technology Council , which includes a working group on cybersecurity.
	Joint cybersecurity training program (2023)	This program will train Indian cybersecurity professionals on the latest cybersecurity technologies and best practices.

STANDARDISATION: DATA PRIVACY & CYBERSECURITY

INDIA

BIS has the following technical committees that are responsible for developing standards related to Data Privacy & Cyber Security

BIS LITD 17 on Information Systems Security and Privacy: BIS through its technical committee "LITD 17 on Information systems security and privacy" is developing standards in the field of Security and Privacy aspects of Information Systems. LITD 17 is the national mirror committee for ISO/IEC TC-JTC 1 SC-27 (P) on Information security, cybersecurity and privacy protection. Please click here for the list of standards published by LITD 17.

- ISO 27000 series of Information Security standards

BIS ETD 18: Industrial Process Measurement And Control

- IS/IEC 62443-4-2 : 2019- Security for Industrial Automation and Control Systems Part 4 Sec 2 Technical Security Requirements for IACS Components

EUROPE

ETSI technical committee on Cyber-Security (TC Cyber): ETSI TC Cyber is responsible for developing standards in the area of security of ICT systems and networks, specifically network infrastructures, devices, services, and protocols etc. ETSI TC CYBER works closely with stakeholders to develop standards that increase privacy and security for organizations and citizens across Europe and worldwide.

- ETSI TS 103 928 V1.1.1 (2023-07): Cyber Security (CYBER); Cyber Security for Home Gateways; Conformance Assessment of Security Requirements as vertical from Consumer Internet of Things
- ETSI TR 103 949 V1.1.1 (2023-05): Quantum-Safe Cryptography (QSC) Migration; ITS and C-ITS migration study
- ETSI TR 103 621 V1.2.1 (2022-09): Guide to Cyber Security for Consumer Internet of Things
- ETSI TR 103 823 V1.1.1 (2021-09): CYBER; Quantum-Safe Public-Key Encryption and Key Encapsulation.

CEN-CENELEC/JTC 13 'Cybersecurity and data protection' sets out application guidelines for data protection and privacy for security technologies, systems and services. Its primary objective is to transport relevant international standards (especially from ISO/IEC JTC 1 SC 27) as European Standards (ENs) in the Information Technology (IT) domain. It also develops 'homegrown' ENs, where gaps exist, in support to EU regulations (RED, eIDAS, GDPR, NIS, etc.). These two streams of activities aim at creating a strategic portfolio of standards in Europe, which fits the European needs. CEN-CLC/JTC 13 works closely with ENISA (The European Union Agency for Cybersecurity) in the context of the European certification schemes, and with the European Commission, in the frame of the cybersecurity-related standardization request under the Radio Equipment Directive (RED).

- EN ISO/IEC 27000 series of standards for Information technology - Security techniques
- CEN/CLC/TS 17880:2022: Protection Profile for Smart Meter - Minimum Security requirements
- EN 17529:2022: Data protection and privacy by design and by default
- EN 17640:2022: Fixed-time cybersecurity evaluation methodology for ICT products
- EN 17927:2023: Security Evaluation Standard for IoT Platforms (SESIP). An effective methodology for applying cybersecurity assessment and re-use for connected products.

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STANDARDISATION: DATA PRIVACY & CYBERSECURITY

(Contd..) EUROPE

- CLC/TC 65X 'Industrial-process measurement, control and automation' is the other main provider of cybersecurity-related standards in the Operational Technology (OT) domain. It prepares standards for systems and elements used for industrial process measurement, control and automation.

- EN IEC 62443 series of standards for Operational Technology (OT) found in industrial and critical infrastructures, including but not restricted to power utilities, water managements systems, healthcare and transport systems.

- CEN/TC 114 'Safety of machinery', which produces standards and other documents on general principles for the safety of machinery, including terminology and methodology has developed a TR on the impact of cybersecurity for machines safety: ISO/TR 22100-4:2020 Safety of machinery - Relationship with ISO 12100 - Part 4: Guidance to machinery manufacturers for consideration of related IT-security (cyber security) aspects (ISO/TR 22100-4:2018).

- Cybersecurity standards are also being developed in several vertical sectors, for example: CEN/TC 301 'Road Vehicles', CEN/TC 377 'Air-traffic management', CLC/TC 9X 'Electrical and electronic applications for railways', CLC/TC 57 'Power systems management and associated information exchange', CEN-CLC/JTC 19 'Blockchain and Distributed Ledger Technologies', CEN/TC 224 'Personal identification and related personal devices', CLC/TC 45AX 'Instrumentation, control and electrical power systems of nuclear facilities'.

Governments from India and the EU/EFTA can collaborate together to create common standards for data privacy and cybersecurity applications through a variety of mechanisms, such as:

GEOGRAPHY	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
BILATERAL AGREEMENTS	• India established the **National Cyber Security Agency (NSCSA)** in 2013 to coordinate cybersecurity efforts, develop guidelines and standards, and raise awareness of cybersecurity risks among businesses and citizens, enhancing India's cybersecurity posture.	• The EU/EFTA has implemented cybersecurity measures, including adopting the Cybersecurity Strategy in 2016, which outlines a common framework for cybersecurity across the EU, and establishing cybersecurity bodies like the **European Union Agency for Cybersecurity (ENISA).**	• The two sides should continue to work together in areas of mutual interest and explore the use of new technologies, such as artificial intelligence and blockchain, to improve the efficiency and effectiveness of standardization cooperation. • India and the EU/EFTA need to enhance cooperation between law enforcement agencies to combat cybercrime. This would help to bring perpetrators of cyberattacks to justice.
INTERNATIONAL AND REGIONAL ORGANIZATIONS	• India has adopted several **ISO and IEC** standards, including ISO 27001 (Information technology—Security techniques—Information security management systems—Requirements) and IEC 62443-4-1 (Industrial automation and control systems–Part 4-1: Cybersecurity–Network and system security requirements for smart grid applications).	• The EU/EFTA has also adopted a number of ISO and IEC standards, and has developed its own cybersecurity framework, the **Network and Information Security (NIS) Directive**. The NIS Directive requires operators of critical infrastructure, such as energy and transportation networks, to implement appropriate cybersecurity measures.	• **The Bureau of Indian Standards (BIS) and the European Committee for Standardization (CEN-CENELEC)** could work together to develop joint cybersecurity standards and/or cooperate at the global platform ISO/IEC/JTC1 on this subject.
IDENTIFY THE NEED FOR COMMON STANDARDS	• **The Indian Cyber Security Framework (ICSF),** developed by the Ministry of Electronics and Information Technology (MeitY), provides a comprehensive framework for cybersecurity risk assessment, mitigation, and incident response. • **The Indian Computer Emergency Response Team (CERT-In)**, under the Ministry of Communications, is responsible for coordinating cybersecurity incident response and promoting cybersecurity awareness.	• The Cybersecurity Act, adopted in 2019, sets out a framework for cybersecurity certification of ICT products, services, and processes. • **The EU Agency for Cybersecurity (ENISA)** plays a key role in promoting cybersecurity standards and supporting the implementation of the Cybersecurity Act. • The **European Standardisation Organisations (ESOs),** such as CEN, CENELEC, and ETSI, are responsible for developing cybersecurity standards at the technical level. • **CERT-EU** is an active member of a number of standard-setting organizations, such as the European Committee for Standardization (CEN) and the International Organization for Standardization (ISO)	• Both India and the EU/EFTA should actively participate in relevant international standardization bodies, such as **ISO, IEC, and ITU, 3GPP, oneM2M** to ensure their voices are heard in the development of global cybersecurity standards. • This could facilitate the movement of ICT products and services between India and the EU/EFTA and reduce the unnecessary burden on businesses.

GEOGRAPHY	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
POLICY & STANDARDISATION	• The government established **the Cyber Security Agency of India (CSAI)** to coordinate cybersecurity efforts across the country. • The CSAI has developed a number of initiatives, including the National Cyber Security Policy, 2013, and the National Critical Information Infrastructure Protection Centre (NCIIPC) guidelines.	• The European Commission adopted **the Cybersecurity Act**, which establishes a framework for the security of network and information systems (NIS). • The Cybersecurity Act also establishes the European Union Agency for Cybersecurity (ENISA), which is responsible for providing technical and operational support to EU Member States in the implementation of the Cybersecurity Act.	• Identify areas where current Indian and EU/EFTA cybersecurity policies are compatible and develop plans for harmonization. • This could help to enhance cybersecurity by making it more difficult for cybercriminals to exploit vulnerabilities and help to increase trust in the digital economy by ensuring that cybersecurity products and services meet common standards.
BIS TSDSI TEC	• The **Bureau of Indian Standards (BIS)** has developed various cybersecurity standards, including those for information security management systems (ISMS) and cyber incident response planning. TSDSI has also adopted/transposed relevant standards and TEC has also prepared reports and implementing MTCTE scheme around it. • TSDSI's Cybersecurity Standards Develops and publishes comprehensive cybersecurity standards for Indian Telecom/ICT sector. • Covers network security, data protection, and incident response • Promotes innovation in cybersecurity through workshops, training programs, awareness campaigns, and collaboration. • Sends experts to international standards development organizations like ITU, 3GPP, oneM2M • Collaborates with government agencies like CERT-In for cybersecurity policy and strategy development. • TEC/DoT's Conducts research to identify cybersecurity threats and vulnerabilities. • Develops cybersecurity standards covering network, data, and application security. • Implements Conformity Assessment Scheme (CAS) for certifying cybersecurity products and services.	• Standards are developed by ETSI-CEN-CENELEC in EU. • Participation in European initiatives like ENISA and ECSO. • Active contribution to new standards in ISG ICTSec meetings. • MoU outlines collaboration areas with ENISA for information exchange and joint standards development. • Involvement in ECSO activities to promote harmonized cybersecurity standards in EU/EFTA. • Collaboration with Global SDOs such as 3GPP, oneM2M, ITU etc. • Collaborates with industry stakeholders for cybersecurity standards adoption. • Organizes workshops and training programs for cybersecurity education. • Collaborates with international organizations like ENISA for cybersecurity standards harmonization.	• Developing standards for emerging technologies, such as 5G and the Internet of Things (IoT). These technologies are increasingly being targeted by cybercriminals, so it is important to develop standards that can protect them. • Promoting the use of encryption and other security technologies. These technologies could help to protect sensitive data from unauthorized access. • Both EU (CEN-CENELEC-ETSI) & Indian SDOs (BIS-TSDSI-TEC) shall cooperate and harmonise standards development activities at 3GPP, oneM2M, ITU, ISO/IEC/JTC1 • Operates conformity assessment schemes like IECEE to certify cybersecurity products and services. • Contributes to cybersecurity standardization in India with IEC 62443, IEC 61131-3, and IEC 60870-5-101. • Contributes to cybersecurity standardization in Europe with IEC 62443, IEC 61131-3, and IEC 60870-5-101.

STANDARDIZATION

GEOGRAPHY	INDIA POLICIES & STANDARDIZATION	EU/EFTA POLICIES & STANDARDIZATION	RECOMMENDATIONS
NQCL	• National Quality Control Laboratory's formulates cybersecurity standards. • Conducts cybersecurity testing and evaluation. • Certifies cybersecurity products and services. • Promotes cybersecurity awareness and training. • Contributes to research and development in cybersecurity. • Enhances cybersecurity landscape in India, promoting robust cybersecurity practices.	• National Quality Certification Laboratory (NCL) Collaborates with European organizations on cybersecurity standardization. • Focuses on sharing best practices, developing common standards, and promoting mutual certification recognition. • Signed MoU with ENISA in 2018 for cybersecurity standardization and capacity building. • Actively participates in ETSI's cybersecurity standardization activities, aligning Indian standards with European standards. • Member of ECCYC, promoting mutual recognition of cybersecurity certifications.	• NQCL could use its research capabilities to help the European cybersecurity community stay up-to-date on the latest threats and to develop effective mitigation strategies.

GAPS, CHALLENGES & RECOMMENDATIONS

In the dynamic digital landscape, cybersecurity and data privacy pose critical challenges for the EU/EFTA and India, each facing unique legislative disparities. Rapid technological advancements demand robust frameworks to safeguard sensitive data and digital infrastructure. India, with its expanding internet user base, grapples with the need for effective regulations, while the EU/EFTA navigates the challenge of harmonizing laws across diverse national boundaries. This exploration of policy disparities highlights the imperative for comprehensive and adaptable strategies.

Both regions share parallel cybersecurity challenges, facing threats from neighboring states, upholding open internet principles, and seeking to shape global cyber norms. India's rapid digitization raises concerns about data breaches and privacy, addressed in a 2020 report from the Ministry of Electronics and Information Technology. Cross-border data movement control is a growing concern, emphasizing the need for international cooperation to manage this complex landscape.

Below mentioned are some of the important gaps and challenges along with recommendations for both geographies, wherever applicable.

GAPS & RECOMMENDATIONS: DATA PRIVACY & CYBERSECURITY			
POLICY	**INDIA**	**EU/EFTA**	**INDIA-EU/EFTA**
DATA ENCRYPTION STANDARDS	• The Digital Personal Data Protection Bill (DPDP Bill), 2023, is a proposed law in India. • India improving data privacy but lacks encryption R&D • Compliance challenges for MeITY policy on cloud services due to weak provisions and enforcement • Insufficient awareness of data encryption's importance • Vital for Indian businesses and data security reputation **Recommendations:** • The DPDP Bill require organizations to implement strong encryption key management practices, such as using secure key storage and access controls. • Bill should encourage the use of DLP tools to prevent the accidental or intentional disclosure of personal data.	• GDPR requires personal data protection but not encryption, EU/EFTA lacks a unified data encryption standard, complicating compliance efforts. • Implementation complexity and costs hinder encryption adoption, especially for small businesses. • Limited awareness, outdated standards, and inadequate key management risk encryption key theft. **Recommendations:** • Need for increased awareness and best practices in data encryption across Europe. • ENISA to develop and promote comprehensive encryption standards and guidelines that encompass various aspects of data encryption, including algorithm selection, key management practices, and compliance requirements.	• India and Europe could collaborate on GDPR and DPDP insights • Create joint frameworks for data encryption and certification • Enhance encryption standards for certified organizations.
SECURE AUTHENTICATION FRAMEWORKS	• India introduces Aadhaar for secure authentication • Even with DPDP bill, data privacy and security concerns persist • Bill does not explicitly mandate the use of MFA(security best practice that requires the use of two or more different factors to verify identity). • Inadequate provisions in the Information Technology Act, 2000, which is undergoing its update/replacement at Meity. **Recommendations:** • The DPDP Bill should develop provisions for continuous authentication, such as requiring users to re-authenticate after a certain period of inactivity or after performing high-risk transactions. This would help to prevent unauthorized users from maintaining access to a user's account.	• EU/EFTA works to bridge the technology gap, more needed for competitiveness. • Many EU/EFTA organizations lack secure authentication knowledge. • Implementation challenging, especially for those with limited resources. **Recommendations:** • Like DPDP Bill's emphasis on risk-based authentication, multi-factor authentication (MFA), and continuous authentication EU/EFTA's GDPR could also aligns these to strengthen cybersecurity across the EU.	• EU/EFTA and India: Prioritize collaboration for secure authentication • Share best practices and strengthen cybersecurity • Promote user education on strong passwords and phishing awareness

(Contd...) GAPS & RECOMMENDATIONS: DATA PRIVACY & CYBERSECURITY			
POLICY	**INDIA**	**EU/EFTA**	**INDIA-EU/EFTA**
DATA BREACH RESPONSE PLANS	• **CERT-In** is a key player in India's cybersecurity landscape including data breach response plan. • Due to lack in resources and expertise, and opaque operations, it's difficult for victim to report . **Recommendations:** • While many improvements & initiatives have been put in place, CERT-In should establish a robust data breach notification mechanism that allows organizations to report data breaches quickly and efficiently.	• The **CERT-EU** is a crucial organization that plays a vital role in coordinating cyber incident response across the EU/EFTA. • The absence of harmonized incident reporting standards across EU/EFTA member states makes it challenging for CERT-EU to gather and analyze data on cyber incidents in a consistent and timely manner. **Recommendations:** • CERT-EU should develop a comprehensive data breach response plan that outlines the roles and responsibilities of different stakeholders, the steps to be taken in the event of a data breach, and the communication protocols to be followed.	• India and EU/EFTA could collaborate on shared data breach response standards & mechanism • Simplifies compliance with both regions' laws • International cooperation involves global agreements and information sharing • Enhances data protection on a broader scale
PRIVACY IMPACT ASSESS- MENTS (PIAS)	• India's **Digital Personal Data Protection Bill** aims for a comprehensive framework • Challenges are in implementing effective Privacy Impact Assessments • Balancing data protection and innovation is crucial **Recommendations:** • The DPDP Bill should strengthen safeguards for government data handling. The bill currently grants broad exemptions to government agencies from the bill's data protection requirements.	• Privacy Impact Assessments (PIAs) are crucial in Europe for data privacy, mandated by the **GDPR**. However, they can be challenging due to multiple assessments and potential delays. **Recommendations:** • Educate employees and consumers on GDPR requirements and privacy risks	• India and EU/EFTA: Create a customized Privacy Impact Assessment (PIA) • Process shall includes risk identification, assessment, mitigation strategies, and documentation
CONSENT MANAGEMENT FRAMEWORKS	• India's **Digital Personal Data Protection Bill** introduces consent managers • Challenge: Ensuring easy withdrawal of consent for transparency and user-friendliness. **Recommendations:** • The DPDP Bill may establish a strong enforcement mechanism like EU's GDPR to ensure that the law is effectively enforced.	• Challenges in consent management frameworks for organizations of various sizes; Potential lack of user-friendliness, raising concerns about uninformed consent and misuse. • Complexity and clarity issues in the ISO 27560 standard. • Lack of harmonization with other cybersecurity standards like NIST CSF and PCI DSS. • Difficulty for international organizations to comply with multiple standards. **Recommendations** • Developing a harmonization process for ISO 27560 and educating organizations about its limitations and cybersecurity importance.	• India & Europe collaborate on consent management frameworks • Focus on legal, regulatory aspects for privacy rights and data sharing • Joint initiatives involve experts, technical standards, research, innovation • Utilizing technologies like blockchain and AI • Organizing awareness-raising events like workshops, seminars, and training • Participation in global forums for knowledge sharing and standards development.

(Contd...) GAPS & RECOMMENDATIONS: DATA PRIVACY & CYBERSECURITY			
POLICY	**INDIA**	**EU/EFTA**	**INDIA-EU/EFTA**
IDENTITY PROTECTION PROTOCOL	• Digital ID systems like India Stack raise privacy and security concerns. • Implementation of DPDP bill is pending **Recommendations:** • India may learn from EU/EFTA's eIDAS by developing its own trusted lists of organizations that could issue electronic identities making it easier for Indians to use their electronic identities to access online services.	• Identity Protection Protocol faces digital era challenges due to tech complexities. • Challenges include connected objects and facial recognition video surveillance. • Highlights the need for ongoing evaluation and improvement of identity protection protocols. **Recommendations:** • EU/EFTA may promote using biometric information(India's Aadhar) to verify identity to prevent frauds.	• India and EU/EFTA collaborate on identity protection protocols • Learn from Europe's eIDAS Regulation and India's Aadhaar program • Develop common identity protection standards for legal compliance
CROSS-BORDER DATA TRANSFER STANDARDS	• The **DPDP Bill** does not offer sufficient protections for data transfers to third-party nations or to any other acknowledged data protection framework. Lack of clarity hinders cross-border data compliance for organizations. **Recommendations:** • India could consider EU/EFTA's GDPR rule adopting a data protection impact assessments (DPIAs) for high-risk data processing activities, including cross-border data transfers..	• EU/EFTA has various national laws and **GDPR**. • GDPR may lack transparency and accountability, making it difficult for individuals and businesses to seek redress for potential violations. • Hinders understanding and compliance, potentially impacting innovation, especially for startups relying on cross-border data transfer. **Recommendations:** • Just like DPDP, GDPR may also provide clear and more objective set of criteria. • Also, they could collaborate on strong safeguards, such as data encryption and access controls	• India and EU/EFTA collaboration for mutual recognition of data protection standards • Facilitates cross-border data transfers and protects Indian citizens' data abroad • Opportunity for Indian companies align with EU/EFTA companies.

SUMMARY OF RECOMMENDATIONS

The synergy between the European Union (EU/EFTA) and India has developed into a robust collaboration, notably various joint efforts through the India-EU/EFTA Joint Working Group on Urbanization, Project SESEI, establishment of Trade and Technology Council (TTC) etc., which underscore a commitment to sustainable urban development, technology exchange, and collaboration in areas like smart cities, governance, Standards collaboration in the areas of Digitization, Clean and Green Energy etc. Key takeaways from the multiple political instruments/ joint groups are mentioned as below:

- **Trade and Technology Council (May 2023):** The establishment of working groups covering topics of Digitalization, Green & Clean Energy, Trade and Market access showcases a joint commitment between India & EU/EFTA. The focus on AI, 5G, quantum computing, and cybersecurity reflects a targeted approach to technological advancement.

- **EU/EFTA-India Strategic Partnership - A Roadmap to 2025 , Joint Declaration of May 2021:** The key focuses of cooperation are around Security, Climate Change, Clean Energy, ICT, Transport, Green Deal, Resource Efficiency, Circular Economy, Clean Tech, Renewables, Artificial Intelligence, Research & Innovation, RAIL. Cooperation around Standardisation and its harmonisation to International Standards and promotion of existing international standards around the topics of Security, pharmaceuticals and medical devices, Environment (Circular Economy), Information and communications technology (ICT), Transport (Railways) etc. Cooperation on global digital standards and network security, 5G technology and beyond 5G, Joint Task Force on Artificial Intelligence, Quantum and High-Performance Computing, protection of personal data and privacy, Partnership on Smart and Sustainable Urbanization etc.

- **EU/EFTA-India Connectivity Partnership aligned with EU's Global Gateway:** Support sustainable digital, transport and energy networks, and the flow of people, goods, services, data, and capital centred on equity and inclusivity for the benefit of both the EU/EFTA and India and assisting in global development efforts, based on Sustainable Development Goals principles. Also, this connectivity partnership endorses facilitating large-scale private investments in sustainable connectivity and commitment to implementing relevant international standards, to ensure a level playing field for companies and to ensure reciprocal access to markets.

- **EU/EFTA-India 'Intent of Cooperation on High Performance Computing and Quantum Technologies':** Focus areas are High Performance Computing (HPC), Weather Extremes & Climate Modeling and Quantum Technologies

- **EU/EFTA-India Clean Energy and Climate Partnership, India Urban Partnership, Partnership on Resource Efficiency, Circular Economy & Resource Efficiency Initiative :** Climate actions; Energy storage technologies; Next generation solar cell; Electric mobility; Advanced biofuels etc. Sharing policies, tech, business solutions, financing mechanisms and cooperation on research and innovation to support smart and sustainable urbanization. Strengthen ongoing dialogues by exchanging views, policies, regulatory and standardization approaches, management systems and policy tools, governance, best practices, business solutions, market access and joint research and innovation opportunities in the field of resource efficiency, energy efficiency and circular economy.

- **EU/EFTA-India Agreement on Science and Technology (2020-2025) & innovation platform**: Research and Innovation in different fields like Clean Energy, ICT, Green Transport, e-mobility, Circular Economy, clean technologies, etc. Supports innovative European solutions with high-impact on problems related to: Sustainability, Health-tech, Logistics and Mobility, Deep tech.

- **Standards Development, Compatibility and Interoperability: Through Project SESEI, the cooperation exist with t**he **Bureau of Indian Standards (BIS), Telecommunications Standards Development Society, India (TSDSI)**, and **Telecommunication Engineering Centre (TEC)**. Both sides are working on many topics around Digitalization, Clean & Green Energy emphasizing standards tailored to M2M/IoT, Smart Infrastructure, Circular Economy. This commitment contributes to global harmonization in the technology sector.

SUMMARY OF RECOMMENDATIONS

The collaboration between India & the EU/EFTA also presents a unique opportunity for shared learning and joint advancements. Recommendations and Key Takeaways include collaborative efforts across various applications, sharing best practices and experiences, and leveraging each other's technologies.

- **Innovative Waste Management:** India's **AWMINS** and EU/EFTA's **SCALS** and **SLUDGE 4.0** offer innovative waste management solutions.
- **Advancements in Smart Metering:** India's **Smart Meter National Programme** & the **EU/EFTA's AMI** focus on smart metering for energy efficiency; Joint efforts in smart Meter deployment and AMI implementation can drive progress.
- **Efficient Water Management:** India's **SAAR** and **EU/EFTA's Water Framework Directive** emphasize efficient water management; Collaboration in deploying IoT-enabled sensors can enhance water resource sustainability.
- **Enhanced Public Safety and Surveillance:** India's **Surveillance** emphasis aligns with the EU/EFTA's **Thales Group Security Digital Platform.**
- **Data Analytics for Urban Planning:** Both India & the EU/EFTA use data analytics for urban planning in projects like **B-Active** and **mySmartlife**.
- **Technology Integration for Sustainability:** Collaboration emphasizes integrating IoT, AI, and data analytics for sustainable urban development.
- **Policy Alignment for Climate-Neutral Urbanization:** India and the EU/EFTA align policies for climate-neutral urbanization in projects like **Innovating Cities**.
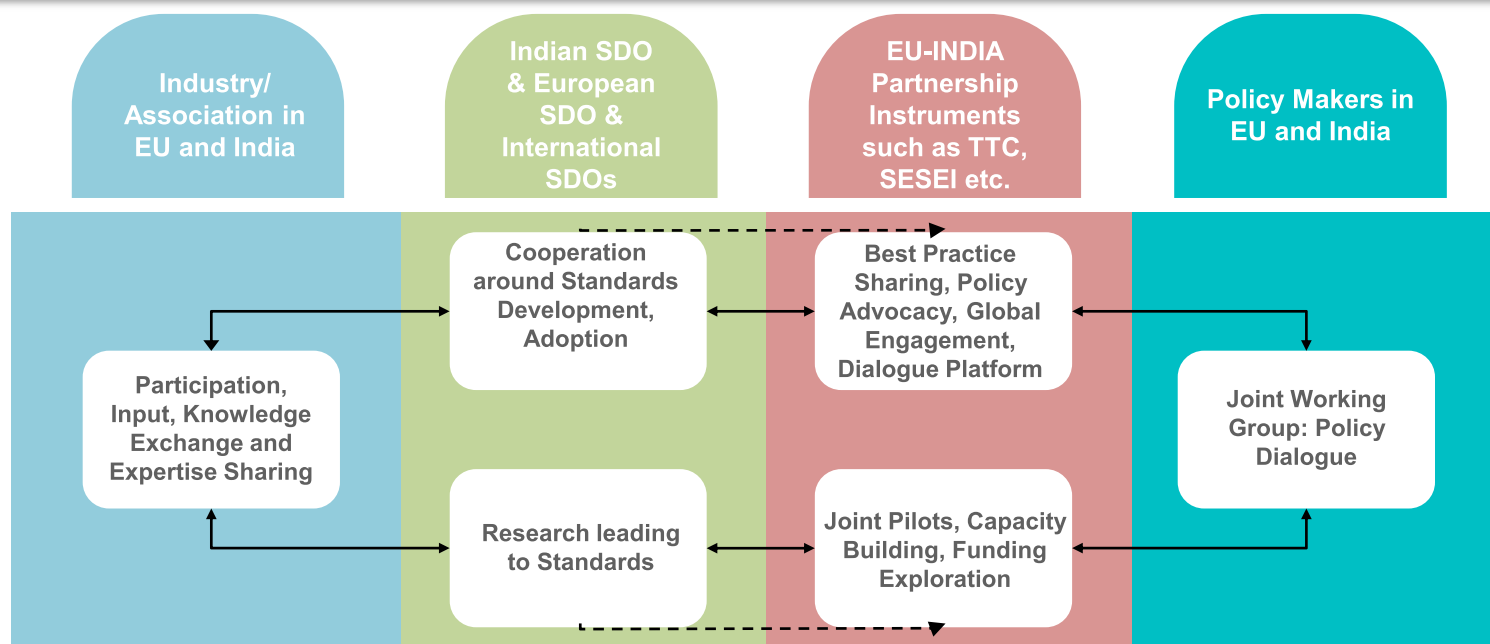
By synergizing their technological prowess and innovative capacities, both India and the EU/EFTA aim to foster cutting-edge solutions that not only enhance the protection of sensitive information but also contribute to the global discourse on best practices in cybersecurity and data privacy.

- **Data Encryption Standards:** India could collaborate on developing and implementing data encryption standards with industry; EU/EFTA could develop a secure cloud computing ecosystem and advocate for data encryption.
- **Consent Management Framework:** India could harmonize DPDP Bill with GDPR for cross-border data transfers; EU/EFTA could promote data anonymization, foster open science initiatives and pseudonymization.
- **Data Breach Response Plans:** India could strengthen establishing a clear data breach notification deadline; EU/EFTA could cooperate on cybercrime investigations.
- **Cross-Border Data Transfer Standards:** India could adopt a risk-based approach to data transfers; EU could work with India to develop common data protection standards and provide technical assistance.
- **Data Retention Policies:** India and EU/EFTA could harmonize data retention requirements and promote data localization.
- **Privacy Impact Assessments (PIAs):** India could collaborate on developing a comprehensive PIA framework tailored to the country's context; EU/EFTA could cooperate with India on PIAs and provide guidance for cross-border data transfers.

The APEC Cybersecurity Working Group and the Cybersecurity Capacity Building Initiative (CCBI) contribute to Indo-Pacific cybersecurity, addressing critical skill shortages. India and the EU/EFTA may collaborate on innovative recruitment and training strategies for comprehensive cybersecurity capacity building. The EU/EFTA's Data Governance Regulation (DGR) provides a robust framework for data protection.

- **India-EU/EFTA Cybersecurity Cooperation:** The EU/EFTA-India Cyber Dialogue and Joint Working Group foster collaboration in data protection, cybercrime prevention, and critical infrastructure. The Joint Declaration (2020) and ICT Standardization Collaboration (2020) emphasize shared visions in cybersecurity. The EU/EFTA-India Trade and Technology Council (2022) facilitates discussions on trade, technology, cybersecurity, and data privacy.

- These collaborative efforts open avenues for joint certification programs, skill exchange workshops, and research partnerships, enhancing India-EU/EFTA cooperation in cybersecurity.

SUMMARY OF RECOMMENDATIONS

Industry/ Association in EU and India	Indian SDO & European SDO & International SDOs	EU-INDIA Partnership Instruments such as TTC, SESEI etc.	Policy Makers in EU and India

Participation, Input, Knowledge Exchange and Expertise Sharing

Cooperation around Standards Development, Adoption

Research leading to Standards

Best Practice Sharing, Policy Advocacy, Global Engagement, Dialogue Platform

Joint Pilots, Capacity Building, Funding Exploration

Joint Working Group: Policy Dialogue

Circular Economy

- **Policy Alignment:** Harmonize regulations across EU/EFTA and India to better integrate sectors, facilitate smoot trade of circular products and monitor data. The India-EU/EFTA Resource Efficiency and Circular Economy partnership can be useful for such initiatives.
- **Harmonizing Standards:** Ensure seamless interoperability of systems across borders by harmonizing standards between India and the EU/EFTA.
- **Knowledge Exchange:** Sharing best practices b/w India & EU/EFTA and implement pilotable solutions in their respective regions.
- **Joint R&D:** Encourage collaborative research and development initiatives to address common challenges and explore innovative solutions. E.g.: Technology transfer, Financing.
- **Capacity Building:** Offering training programs and research initiatives for their own manpower as well as through student/professional exchange programmes.

Connectivity in Smart Cities

- **Facilitate knowledge exchange & best practices** between Indian and EU/EFTA stakeholders on smart city solutions, such as CITIIS, Varanasi Smart City Project, and EU/EFTA Eco-Cities PPPs
- **Support innovation and capacity building** in digital skills and competencies, such as through EU/EFTA-India Innovation Partnership, Horizon Europe, and EU/EFTA-India Digital Investment Forum.
- **Collaboration on Emerging Topics Research & Standardization:** Joint research and Standardization on 6G, AI/ML, Quantum etc.
- **Data Governance:** Developing robust data governance frameworks for smart cities, ensuring data privacy, security, and ethical use.
- **Digital Twin Tech:** Exploring collaboration opportunities in the application of digital twin technology in smart cities.
- **Encouraging PPPs:** Foster public-private partnerships to leverage the strengths of both sectors in implementing smart city solutions.

Data Privacy

- **Harmonizing Standards:** Ensure seamless interoperability of systems across borders by harmonizing standards between India and the EU/EFTA.
- **Joint R&D:** Encourage collaborative research and development initiatives to address common challenges and explore innovative solutions.
- **Data Localization Progress:** India's evolving approach focuses on cross-border data transfers.
- **Data Transfer Assessments:** Key assessments are adequacy and comparable protection.
- **Data Privacy Emphasis:** India's growing data privacy focus stems from public awareness and protective measures.
- **Consent Management Framework:** India to harmonize DPDP Bill with GDPR for cross-border data transfers; EU/EFTA to promote open science initiatives, data anonymization & pseudonymization

Cyber Security

- **Policy Harmonization:** India and EU/EFTA, can work towards harmonizing cybersecurity policies for a unified approach against cyber threats.
- **Cybersecurity Standards:** India and the EU/EFTA, can promote the adoption of international cybersecurity standards among businesses. shall work together to have Global Cyber Security Standards developed at Global Platform such as JTC1, 3GPP, ITU and oneM2M for their adoption and implementation.
- **Information Sharing:** India, the EU/EFTA, can establish a platform for sharing threat intelligence, enabling early detection and mitigation of cyber threats.
- **ENISA Partnership:** NCL's MoU with ENISA facilitates collaborative efforts in cybersecurity standardization, threat exchange, joint training, and international standard adoption.
- **Aligning Cybersecurity Initiatives:** India's potential accession to Budapest convention holds the promise of aligning its cybersecurity initiatives with global norms, further fortifying international collaboration in addressing cyber threats & cybercrime.

SUMMARY OF RECOMMENDATIONS

CIRCULAR ECONOMY

- To strengthen the Circular Economic principles (CE) in both India and the EU/EFTA, collaborative efforts should be prioritized while using existing partnership instruments between EU/EFTA and India such as TTC, Project SESEI etc. These partnership instruments shall facilitate the establishment of a knowledge-sharing platform between Indian organizations, fostering a continuous exchange of insights, best practices, research findings, Policy Dialogue and Standards cooperation and formulations.

- Engagement through joint initiatives can include collaborative research projects, workshops, and forums focused on addressing common challenges in plastic and electronic waste management. This platform can serve as a hub for promoting innovation, policy advocacy, and the development of sustainable business models aligned with circular principles.

- Identify unique circumstances of India and EU/EFTA and devise an approach suitable to the respective regions. For example, India needs better infrastructure and more formalization of he waste management processes based on Standards and Guidelines, while EU/EFTA needs more of consumer awareness and behaviour change. A unique blend of information based, market based, and regulatory measures will work for respective regions.

- Constant engagement and collaborations to learn from initiatives from each other's region and test out pilots to test success of initiatives and schemes. For example: Financial incentives and tax reductions are prevalent in EU/EFTA which can be tried out in India. Additionally, policy harmonization is crucial for effective collaboration. India and the EU/EFTA should work towards aligning their regulatory frameworks, drawing inspiration from successful policies in each region. This includes standardizing definitions, regulations, and enforcement mechanisms related to recycled plastics, single-use plastics, and eco-friendly alternatives. Regular dialogues between regulatory bodies, facilitated by Standards development organizations and regulatory authorities, can lead to the development of common standards and guidelines. Furthermore, creating joint certification programs and recognizing each other's certifications can foster trust and streamline the integration of circular practices in cross-border trade. These collaborative measures can contribute to the successful implementation of circular economy principles, promoting sustainability and resilience in both regions.

SMART CITIES: DIGITAL SECTOR

To enhance its position in Asian connectivity, including in India, the EU/EFTA could explore prioritizing Standards based technology, research, capacity building, and skill development in India. This approach will foster innovative, cost-effective, interoperable and scalable connectivity solutions for mutual benefit based on global standards established in close cooperation through existing partnership instruments such as project SESEI, Global Connectivity platforms, TTC, etc. The following summary covers important catalysts for India-EU/EFTA Collaboration.

SUMMARY OF RECOMMENDATIONS

SMART WASTE MANAGEMENT

Digital connectivity in smart cities encompasses various facets, each presenting unique challenges and opportunities for collaboration between India and the European Union. In the realm of smart waste management, both regions stand to gain mutual benefits through initiatives aligned with India's Swachh Bharat Abhiyan and the EU/EFTA's Horizon 2020 Project - CityLoops. The shared focus on sustainable waste management and behavioral change opens avenues for collaboration, despite challenges like high costs and low awareness that need joint attention.

- **Collaboration:** Collaborate on India's Swachh Bharat Abhiyan, aligning it with the EU/EFTA's Horizon 2020 Project - CityLoops, to share insights and best practices in sustainable waste management.
- **Knowledge Sharing:** EU/EFTA's regulatory interpretations for plastic waste management, addressing challenges like high costs and low awareness.

SMART WATER MANAGEMENT

Smart water management emerges as another critical area, where India and the EU/EFTA face common challenges such as inconsistent national-level policies, aging infrastructure, and a lack of robust cost–benefit analysis. By joining forces, the two regions can work towards enhancing water management practices, increasing public awareness, and fostering more sustainable cities.

- **Collaboration:** Collaborate on India's National Digital Communications Policy and BharatNet project, adopting EU/EFTA's ICT standards for water management.
- **Knowledge Sharing:** Explore EU/EFTA's successful PPP models for efficient water management, aligning with India's emphasis on digitalization and sustainability.

SMART METER LIGHTING

Collaborative opportunities shall be extended to smart meter lighting projects, including initiatives led by organizations like EESL and Endesa. Knowledge exchange on consumer acceptance, integration, and financing models can significantly benefit both regions. Jointly addressing challenges faced by power companies in smart metering, such as Adani Energy Solutions, Tata Power, and Torrent Power, further strengthens the collaborative landscape.

- **Collaboration** : Collaborate on India's Smart Meter Rollout and Smart Grid Pilot Projects, leveraging EU/EFTA's experience with SCALS and IoT-based street lighting systems.
- **Knowledge Sharing**: Benefit from EU/EFTA's 50%+ smart meter penetration, understanding consumer acceptance and financing models.

SUMMARY OF RECOMMENDATIONS

PUBLIC SAFETY SURVEILLANCE

In the realm of public safety surveillance, India and the EU/EFTA actively engage in joint initiatives like Safe City Projects and S4AllCities. Sharing insights on public safety, surveillance, and smart city projects forms a crucial aspect of this collaboration, with a shared focus on addressing data privacy, security, and management issues in biometric surveillance
- **Collaboration**: Collaborate on India's Safe City Projects and S4AllCities, offering insights on public safety and surveillance.
- **Knowledge Sharing**: Leverage EU/EFTA's experience in security management, cybersecurity, and risk estimation for comprehensive public safety.

DATA ANALYTICS AND URBAN PLANNING

The collaborative landscape shall be extended to data analytics and urban planning, where India and the EU/EFTA join forces on Big Data Analytics in Smart Cities. The exchange of insights and experiences in data analytics for smart city services, along with addressing data challenges and promoting data-driven governance, underscores the potential for fruitful collaboration in shaping the smart cities of the future.
- **Collaboration**: Collaborate on India's Open Data Portal, adopting EU/EFTA's methodologies for international data sharing and assessment.
- **Knowledge Sharing**: Share India's progress in data readiness and advocate for Open Government Data principles for improved data sharing.

SMART CITIES: ENERGY SECTOR

- Cross border collaboration and exchange for interoperability of standards in energy storage and management sectors. This is to increase trust and smooth operation of energy trade and data sharing so that efforts by individual countries or regions can bring the maximum benefit to the global goal of sustainable energy.

- Energy resilience through investments in smart and decentralized grid through promotion of such among citizens and consumers. This is to ensure an overall increase in green energy production at localized/micro level and transition of consumers into producers. Public awareness campaigns are crucial for quicker adoption of such transition.

- Leveraging the power of IoT for real-time monitoring and control of energy consumption and production in buildings, enabling adaptive energy management systems.

- A mix of measures like regulatory as well as incentives like Green financing in terms of public procurement, mandatory green procurement by big conglomerates, tax incentives, green certifications and rewards etc. must find a fine balance.

SUMMARY OF RECOMMENDATIONS

SMART CITIES: TRANSPORT SECTOR

- Integration of existing public transport infrastructure is must before new infrastructure development for the first and last mile connectivity.

- Close collaboration with private sector for new infrastructure to raise investment, public awareness creation, increase competition, cut costs and speed up implementation.

- Leveraging the power of IoT and AI for real-time monitoring, intelligent traffic management, congestion control along with robust data protection and ethical and transparent surveillance protocols.

- Cross border collaboration and exchange for interoperability of standards in the transport sector. This increases trust and smooth operation of trade and data sharing so that efforts by individual countries or regions can bring the maximum benefit to the global goals of sustainable energy. Learning through pilot implementation of exemplary models and expansion.

CYBERSECURITY & DATA PRIVACY

- The Digital Personal Data Protection (DPDP) bill in India, GDPR in EU/EFTA and the Budapest Convention on Cybercrime act as legislative frameworks aimed at addressing issues related to digital privacy, cybersecurity, and cybercrime.
- Consent management frameworks stand out as a critical domain for collaboration between India and Europe. This involves addressing legal and regulatory aspects related to privacy rights and data sharing. Joint initiatives are envisioned to include the participation of experts, the development of technical standards, and a focus on research and innovation to create effective frameworks.
- Furthermore, the collaboration emphasizes the utilization of cutting-edge technologies like blockchain and artificial intelligence (AI) to bolster cybersecurity. Active participation in awareness-raising events, workshops, seminars, and training programs is encouraged to facilitate knowledge sharing and contribute to the development of global standards in the field.
- Identity protection protocols form an integral part of the collaborative efforts, with India and Europe seeking to learn from each other's experiences, particularly from Europe's eIDAS Regulation and India's Aadhaar program. The goal shall be to develop common identity protection standards that align with legal compliance requirements.
- Finally, the collaboration extends to cross-border data transfer standards. India and the EU/EFTA are working towards mutual recognition of data protection standards, facilitating secure cross-border data transfers. This collaboration presents an opportunity for Indian companies to align with EU/EFTA counterparts, potentially leading to the establishment of offices or research and development centers in the EU/EFTA & India.
- India and Europe are forging a robust alliance in cybersecurity and data privacy, resulting in key takeaways that reflect a shared commitment to fortifying data protection measures. One significant focus area is data encryption standards, where collaborative efforts draw insights from GDPR (General Data Protection Regulation) and India's Digital Personal Data Protection Bill (DPDP). The collaboration extends to the establishment of joint frameworks for data encryption and certification, thereby elevating standards for organizations that attain certification.
- Secure authentication frameworks are another crucial aspect of this collaboration. EU/EFTA and India prioritize joint efforts to strengthen cybersecurity, emphasizing the sharing of best practices and promoting user education on essential aspects like strong passwords and phishing awareness. This cooperative approach seeks to create a more secure digital environment for both regions.
- Privacy impact assessments (PIAs) are highlighted as a potential area of collaboration. The envisioned customized PIAs would involve a comprehensive process encompassing risk identification, assessment, mitigation strategies, and thorough documentation. This initiative aims to enhance the understanding and management of privacy implications in various contexts.

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	https://transport.ec.europa.eu/news-events/news/sustainable-transport-rules-boost-intelligent-transport-systems-safer-and-more-efficient-transport-2023-06-09_en

THANK YOU