ITS India Forum's comments on the Consultation Paper on the Regulatory Framework for Vehicle-to-Everything (V2X) Communication

ITS India welcomes the Telecom Regulatory Authority of India (TRAI)'s Consultation Paper, which focuses on enhancing road safety and reducing fatalities through the implementation of intelligent transport systems. The paper primarily addresses Vehicle-to-Infrastructure (V2I) communication, a critical component of Vehicle-to-Everything (V2X) technologies. Concurrently, Vehicle-to-Vehicle (V2V) communication is being facilitated by the Department of Telecommunications (DoT) through the allocation of 30 MHz spectrum in the 5875–5905 MHz band, designated for initial deployment of C-V2X technology.

India continues to face an alarming road-safety challenge, with high numbers of accidents and fatalities each year that disproportionately affect the economically productive population. In this context, timely consultation, informed deliberation, and actionable recommendations that speed the deployment of proven, technology-driven safety measures are not only welcome but essential.

Key Findings

- India faces a severe road safety challenge, with over 150,000 fatalities annually in recent years, including 177,177 deaths in 2024 alone.
- Conventional road safety measures have not been sufficient, leading to an urgent need for advanced technologies like V2X to curb the high number of daily fatalities.
- TRAI has initiated a consultation process to establish a regulatory framework for V2X communication, aiming to improve road safety in India.
- The consultation paper emphasizes Vehicle-to-Infrastructure (V2I) communication as a vital part of the broader V2X ecosystem.
- The Department of Telecommunications (DoT) has agreed to provide 30 MHz of spectrum in the 5875–5905 MHz band for the deployment of cellular-V2V technology.
- The TRAI consultation paper suggests that V2V communication between On-Board Units (OBUs) might not require authorization under the Telecommunications Act, 2023.
- The Ministry of Road Transport & Highways and DoT are collaboratively addressing this issue, recognizing the potential of V2X technologies

Given these persistent and alarming figures, it is evident that conventional road safety methods are failing to adequately address the crisis. There is an urgent need for emerging technologies like Vehicle-to-Everything (V2X) communication to significantly reduce these preventable deaths and save the hundreds of lives lost daily on Indian roads. The Ministry of Road Transport & Highways and the Department of Telecommunications (DoT) are jointly taking up this critical issue, recognizing the transformative potential of V2X technologies to enhance road safety and protect citizens' welfare.

ITS India's detailed responses to the Consultation Paper's questions are presented below.

Q1. Whether there is a need to introduce an authorisation for vehicle-to-infrastructure (V2I) communication service under Section 3(1)(a) of the Telecommunications Act, 2023? If yes, please provide input with respect to the following aspects:

(a) Eligibility conditions for the authorisation;

(b) Period of validity of the authorisation and conditions for its renewal;

(c) Service area of the authorisation;

(d) Scope of service of the authorisation;

(e) Technical, operating, security related conditions etc. of the authorisation;

(f) Any other related aspect. Kindly provide a detailed response with justification.

ITS India Response:

- RSUs should be enabled under a General Authorisation with no individual station licensing.
- No dedicated V2I/RSU authorisation in the sense of an exclusive, geographically protected license is required.
- RSUs should be enabled through an implied-authorisation approach under Section 3(3) and Section 4(6) of the Telecommunications Act, 2023, recognising that V2X safety messaging is inherently broadcast and the spectrum use is shared and non-exclusive.

***Indian Telecommunications Act, 2023, Section 3(3)**: The Central Government, if it determines that it is necessary in the public interest so to do, may provide exemption from the requirement of authorisation under sub-section (1), in such manner as may be prescribed."*

***Indian Telecommunications Act, 2023, Section 4(6):** "4(6) The Central Government, if it determines that it is necessary in the public interest so to do, may exempt,—*
(a) from the requirement of assignment under sub-section (2), in such manner as may be prescribed; and
(b) by notification, specific usages within specified frequencies and parameters, from the requirements of sub-section (2)."

Global Best practice: ITS is typically enabled through general authorisation/ class licensing or license-by-rule constructs with harmonised technical conditions rather than per-site exclusive licensing (e.g., CEPT/ECC Decision (08)01; ACMA ITS Class License; FCC ITS framework; Ofcom SRD license-exemption principles).
This implied- authorization/license is expressly without prejudice to shared access; it does not constitute assignment of spectrum conferring exclusivity or interference protection under the Telecommunications Act, 2023.

Q2. In case your reply to Q1 is no, what should be the mechanism for enabling, facilitating and regulating vehicle-to-infrastructure (V2I) communication service in India? Kindly provide a detailed response with justification.

ITS India Response:

This should be a light-touch approval or permit framework to reduce ecosystem friction.

Mechanism: Enable RSUs under a General Authorisation (no individual station licensing), with published technical and security conditions applicable to all compliant deployments. Governance (not licensing): Require RSU registration/notification (operator + site details) in a registry for security governance, accountability, and interference issue resolution. Registration must not be considered as a permission step and must not confer exclusivity. Scope of any "permit": Any permissions should be limited strictly to civil right-of-way / mounting / safety approvals by the road authority (analogous to placing traffic signals/signage), and must not be framed as telecom/spectrum authorisation.

Eligibility: Road authorities/road operators and their authorised integrators may register RSUs, consistent with RSUs being road infrastructure (not a telecom service).

This registration is expressly without prejudice to shared access; it does not constitute assignment of spectrum conferring exclusivity or interference protection under the Telecommunications Act, 2023.

Q3. Any other suggestions relevant to the authorisation for vehicle-to-infrastructure (V2I) communication service may be submitted with proper explanation and justification.

ITS India Response:

- Establish a registry-based governance mechanism under the General Authorisation:
    - RSU location (geo-coordinates/road segment), operator contact, device compliance attestation (EIRP/OOBE/standards), and security credential policy identifiers.
- Also, for future enablement of enhanced V2I traffic safety services (and applications from the cloud), having a unified framework and common standards is beneficial
- Establish a clear technical compliance test to ensure technical testing without requiring individual licensing.
- The registry, if any at local body level, must be expressly non-rights-conferring: registration shall not create any exclusive spectrum entitlement or protection claim; operation remains on a shared, non-exclusive basis subject to technical conditions.

Q4. Whether a specific technology (such as LTE-based C-V2X, NR-based C-V2X etc.) should be prescribed for the implementation of C-V2X in India? If yes, which technology should be adopted for the implementation of C-V2X? If no, in what manner, the issues related to inter-operability between different technologies should be addressed? Kindly provide a detailed response with justification.

ITS India Response:

- We recommend for technological neutrality in the authorisation. Maintain flexibility while ensuring interoperability via standards, conformance profiles and testing. However, today LTE-V2X (20 MHz channels) is well-suited for initial nationwide safety deployments.
- Interoperability between different vendors and implementations for basic-safety using LTE-V2X should be ensured by adopting common message sets, security framework, and compliance test profiles.

Q5. Whether there is a need to bring road-side units (RSUs) and on-board units (OBUs) under the regime of Mandatory Testing Certification of Telecom Equipment (MTCTE)? If no, in what manner, Electromagnetic Interference (EMI), Electromagnetic Compatibility (EMC), safety, technical and security requirements prescribed by TEC/ DoT may be ensured? Kindly provide a detailed response with justification.

ITS India Response:

- Focus on minimizing certification overheads.
- Preference for self-certification.
- Since it is expected that both OBUs and RSUs will be deployed in a delicensed spectrum band, only Equipment Type Approval (ETA) by TEC should suffice.
- Focus on standards compliance and RF emission compliance.

Q6. To ensure inter-operability among different RSUs/ OBUs, whether there is a need to standardize the layered communication framework (stack) for higher layers (other than the access layer in which C-V2X will be used) of Intelligent Transportation System (ITS)? If yes, which standard for ITS stack and security should be adopted? Specifically, whether the ETSI standard for ITS stack and security, as recommended by the Task Force on Intelligent Transportation System for the use of 5.9 GHz (mentioned at para 3.5 of this consultation paper) should be adopted? If no, in what manner, inter-operability among different RSUs/ OBUs can be ensured? Kindly provide a detailed response with justification.

ITS India Response:

- Yes. Interoperability requires standardization above the access layer (message sets, facilities/networking, and security).
- A common ITS stack avoids fragmented deployments and ensures that safety broadcasts are universally decodable by compliant receivers.
- Adopt the Task Force recommendations as baseline.
- Maintain conformance profiles and plug tests to validate multi-vendor interoperability across RSUs and ecosystems.
- Security should follow an internationally recognised V2X security framework (IEEE 1609.2 style) with clear certificate policies and misbehaviour reporting procedures, integrated with RSU registration for auditability.
- Agree with the Final Report and Recommendation of the Task Force on ITS
- Propose LTE-V2X for Radio Layer
- Propose ETSI TC ITS Rel.2 for support of 20 MHz for the message-set

Propose IEEE 1609.2 based SCMS with support of multiple root CAs for implementation flexibility.

Q7. Whether there is a need for prescribing a security framework for ITS/ C-V2X in India? If yes,

(a) What should be the security framework for ITS/ C-V2X?

ITS India Response:

- A national PKI framework for V2X consistent with the recommendation of the Task Force on ITS is required.
- The framework should include **PKI governance** (root-of-trust), **certificate policy**, enrolment/authorization credentials, **revocation**, and **auditability via RSU registration**.

(b) Which agency [such as Controller of Certifying Authorities (CCA), Ministry of Electronics & Information Technology (MeitY)] should implement the Public Key Infrastructure (PKI) framework for ITS/ C-V2X in India?

ITS India Response

- The implementing agency should operate the national root of trust and policy controls, with operational delegation to accredited entities as required for scale and resiliency.
- CCA/RCAI under the MeitY may be best suited for central root of trust.
- Preferably have a national policy level recognition of IEEE 1609.2 based ITS Security Root CA

(c) How to ensure coexistence of V2X PKI certificates with the legacy PKI mechanism in India i.e. based on X.509, operated by Root Certifying Authority of India (RCAI)?

ITS India Response

- Maintain a V2X-domain security architecture with defined interworking boundaries at policy/root level only, avoiding unnecessary coupling of end-device certificate processing; ensure governance is enforceable via certificate policy.
- Preferably have a national policy level recognition of IEEE 1609.2 based ITS Security Root CA
- Essential to have V2X Security certificates within the ITS-domain only based on V2X security. Interworking, if any, with X.509, to be limited only at Root CA level and not percolate to end-devices (OBUs and RSUs).

Q8. What should be the regulatory framework for the assignment of frequency spectrum to the entities holding the proposed V2I communication service authorisation? Specifically,

(a) Whether there is a need for partitioning the 30 MHz spectrum (5,875-5,905 MHz) for specific applications such as "safety applications" and "operational applications (non-safety applications)"?

ITS India Response:

The entire range to be harmonized in India for safety applications.

(b) In case more than one authorised entity has to operate in the same geographical area, what should be the mechanism for simultaneous use of the spectrum? Specifically, whether the spectrum should be divided amongst the authorised entities in an exclusive manner, or should the authorised entities utilize the spectrum in a shared manner?

ITS India Response:

Where more than one authorised entity operates in the same geography, spectrum use must be **shared and non-exclusive**. V2X is designed for coexistence; geographic exclusivity would impede interoperability and impose

artificial scarcity.

- By design, technology supports shared use of spectrum. No geographical exclusivity. However, for implementation and operational reasons, a competent authority may decide on who is permitted within a segment of road governed by them.

(c) If your response to part (b) is "in an exclusive manner", what should be the minimum quantity of spectrum to be assigned to each entity holding the proposed V2I communication service authorisation? If your response to part (b) is "in a shared manner", whether there is a need to prescribe a mechanism for interference management?

ITS India Response:

Interference management should be **registry-enabled**, non-exclusive assignment-based. Mandate conformance to technical limits (EIRP/OOBE), congestion control and security as **conditions of authorisation/registration**; use the RSU registry for traceability and remedial action.

(d) For interference management, whether there is a need to prescribe –

(i) minimum directionality of road-side unit (RSU), or

(ii) protection distance between the RSUs, or

(iii) maximum antenna height for RSUs? If yes, what should be such parameter(s)?

ITS India Response:

Not applicable. Only the EIRP limit is sufficient. It may not be necessary to prescribe rigid directionality/protection distance/antenna height as hard authorisation conditions. These are deployment-engineering choices that vary by intersection geometry and work-zones. A clear EIRP/OOBE envelope and standards compliance are sufficient; the registry may capture antenna height/type for audit where needed

(e) Whether there is need to mandate a mechanism for obtaining prior approval (analogous to SACFA clearance) for the establishment of RSUs by the entities holding the proposed V2I communication service authorisation? If no, in what manner, the establishment of RSUs should be regulated?

ITS India Response:

- **No** SACFA-analogous pre-clearance should be mandated for RSUs under telecom/spectrum regulation. RSUs should operate under **Class Licence / General Authorisation / Licensed-by-Rule**.
- Any approvals should be limited to **civil/ROW/structural safety permissions** by the road owner (traffic signal/signage analogy), and must not be treated as spectrum authorisation or site licensing. This may be by a competent authority (e.g., entity governing the road and traffic.)

(f) For avoiding (i) interference between RSUs, (ii) interference between RSUs and OBUs, and (iii) interference between OBUs, whether the radiated power limits for OBUs and RSUs and OOBE limits, recommended by the Task Force on Intelligent Transportation System for the use of 5.9 GHz (mentioned at para 3.4 of this consultation paper) should be adopted? If no, what should be the radiated power limits for OBUs and RSUs and OOBE limits?

Response: **2W** (33dBm) EIRP for both OBU and RSU. Adopt the OOBE limits agreed by Part 1

Recommendation of Task Force on ITS.

(g) What should be the maximum period of assignment of spectrum to the entities holding the proposed V2I communication service authorisation?

ITS India Response:

Classical "exclusive assignment period" is not applicable under shared/non-exclusive access. RSU registration should be continuous (subject to compliance with conditions of authorisation), with periodic update obligations (e.g., every 5 years or upon change).

(h) Whether there is a need to prescribe roll-out obligations associated with the assignment of spectrum to the entities holding the proposed V2I communication service authorisation?

ITS India Response:

An approach similar to US DOT V2X Implementation Roadmap strategy would be great to prioritize and incentivize early implementation of RSU on accident prone intersections and segments of roads. Roll-out obligations should not be spectrum-assignment based. Prefer national/State road-safety programmes to prioritise high-risk corridors/intersections and incentivise early RSU deployments.

(i) Whether there is a need to introduce a provision for the surrender of frequency spectrum? Kindly provide a detailed response with justification.

ITS India Response:

Since there is no exclusivity, this concept of surrender of spectrum does not arise. Surrender of spectrum is not applicable as no exclusivity is conferred. Decommissioning is handled via registry updates and cessation of operation.

Q9. Whether there is a need for prescribing timelines for processing the applications for the assignment of spectrum to the entities holding the proposed V2I communication service authorisation? Kindly provide a detailed response with justification.

ITS India Response:

- **Not applicable** under the proposed Class Licence / General Authorisation / Licensed-by-Rule regime because there is no individual spectrum assignment for RSUs
- Under the proposed registration model, per-site spectrum assignment processing is avoided. RSU establishment should be enabled via online registration with automated acknowledgement and defined exception-handling timelines only for flagged cases.
- If any approvals are retained, prescribe short timelines (e.g., 15–30 working days) to prevent safety deployments from being delayed by administrative processes.
- Pricing can't be added to the safety spectrum as road safety is a fundamental right, and citizens can't be discriminated between paid/unpaid, linked to spectrum licensing, to avail safety.

Q10. Whether there are any other suggestions related to assignment of spectrum to the entities holding the proposed V2I communication service authorisation? Please provide a detailed response with justification.

ITS India Response:

- Explicitly state that ITS spectrum access for RSUs is **shared** and **non-exclusive**; the RSU registry is for governance and accountability and does not create exclusive rights.
- Create a single national conformance and test regime (RF + protocol + security) to ensure interoperability across all deployments and States/ULBs.

Q11. Any other issues/suggestions relevant to the regulatory framework for V2X communication may be submitted with proper explanation and justification

ITS India Response:

- India should adopt global best practice for ITS safety spectrum: harmonised technical conditions, shared access, and proportionate authorisation for RSUs via a registry. This enables scale, interoperability, and rapid safety impact.
- Key international parallels (non-exhaustive): (i) CEPT/ECC Decision (08)01 (ITS in 5.9 GHz, general authorisation approach), (ii) ACMA Radiocommunications (Intelligent Transport Systems) Class Licence 2017 (no application/fees; compliance-based), (iii) FCC ITS framework in 5.9 GHz with differentiated governance for OBUs/RSUs, (iv) Ofcom SRD licensing principles supporting licence exemption for low interference risk devices.

Q12. In view of the public welfare-oriented nature of V2X applications and the need to encourage the deployment of such infrastructure and services, should there be spectrum charges levied on the spectrum assigned to the V2I communication service authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

- No spectrum usage charges should be levied.
- ITS/V2X safety applications are public-welfare oriented and delivered via shared, non-exclusive spectrum access.
- Imposing SUC will slow deployment and reduce safety benefits.
- Pricing can’t be added to the safety spectrum as road safety is a fundamental right, and citizens can’t be discriminated between paid/unpaid, linked to spectrum licensing, to avail safety.
- International ITS frameworks typically rely on general authorisation/class licensing approaches that minimise cost/administrative barriers (CEPT/ECC, ACMA, Ofcom).

Q13. If answer to Q12 is affirmative, whether the spectrum charges for the V2I communication service authorised entities under the proposed V2I communication service authorisation should be determined based on the spectrum charging methodology prescribed by the Department of Telecommunications (DoT)

vide its order dated 11.12.2023? If yes, then which of the radiocommunication services specified in the said order, should be taken as basis for calculation of spectrum Charges? Please provide detailed justification in support of your response.

ITS India Response:

- Not applicable. In a shared, non-exclusive safety band, spectrum charge methodologies based on exclusive licensed services are not appropriate for an application that is primarily for the safety of life.
- At most, nominal cost-recovery fees may be considered solely for RSU registry administration and compliance monitoring.

Q14. If answer to Q12 is affirmative, whether the spectrum charges for the V2I communication service authorised entities under the proposed V2I communication service authorisation should be levied as a percentage of Adjusted Gross Revenue (AGR)? If yes, are there any specific operational/ non-operational revenue items that should be included in/ excluded from AGR for the purpose of determination of spectrum charges? Please provide your response with detailed justification.

ITS India Response:

- The application of this spectrum band is for the public good and the safety of life. Charging service providers for deploying V2I systems will demotivate and discourage them from providing such services, and the overall objective of reducing fatalities on roads will be defeated.
- RSU deployments are public infrastructure. The implementation agency in most cases would be a city / state / central government agency.
- AGR-linked charging may be conceptually misaligned and administratively burdensome.
- If any fee is levied, it should be a flat, nominal cost-recovery fee unrelated to revenues so as to ensure that implementation agencies are not demotivated and discouraged from such deployments towards safety of life on roads.

Q15. If response to questions 13 and 14 is negative, then what should be the appropriate methodology for determination of spectrum charges for the V2I communication service authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

This is for public good, there should be exemption from spectrum usage charges. The radio devices are low-power and use the spectrum in a shared manner. If any, only nominal cost recovery for registry operations and compliance enforcement may be levied, so as not to demotivate or discourage implementation agencies.

Q16. For spectrum assigned to the V2I communication service authorised entities under the proposed V2I communication service authorisation, what should be the appropriate payment terms for spectrum charges, if any? Please provide your response with detailed justification.

ITS India Response:

As mentioned above, we strictly do not recommend any spectrum usage charges as it is for the public good

and citizens' welfare. Over 500 lives are being lost daily on Indian roads.

Q17. What are the potential sources of revenue, if any, for an V2I communication service authorised entity under the proposed V2I communication service authorisation? Please provide your response with detailed justification.

ITS India Response:

V2I safety services are predominantly non-commercial public-good functions (road safety, traffic efficiency, emergency response). Revenue-linked frameworks should not be presumed. There is no potential for revenue generation. Where indirect monetisation exists (e.g., value-added analytics), it should not be the basis for spectrum fees in a shared safety band.

Q18. What should be the definitions of Gross Revenue (GR), Applicable Gross Revenue (ApGR), and Adjusted Gross Revenue (AGR) for V2I communication service authorised entity under the proposed V2I communication service authorisation? Further, what should be the relevant items of revenue, exclusions and deductions and consequent definitions of GR, AGR and ApGR? Please provide your response with detailed justification.

Q19. What revenue components should be included in, or excluded from, the computation of Gross Revenue (GR), Applicable Gross Revenue (ApGR) and Adjusted Gross Revenue (AGR) for the purpose of determining authorisation fees or spectrum charges for the proposed V2I communication service authorisation? Please provide your response with detailed justification.

Q20. Whether revenue derived from safety-related V2X services under the proposed V2I communication service authorisation should be excluded from the computation of AGR, in view of their public interest and non-commercial nature? Please provide your response with detailed justification.

ITS India Response (Q18, 19, 20):

Safety broadcasts are public interest functions and should not be burdened by revenue-based levies. There is no specific question related to cyber security framework in the paper still ITS India would like to highlight the important dimensions which need consideration with respect to cyber security of the V2X network:

- **Data sharing and privacy**
- **Cybersecurity for V2X systems**
- **Safety-critical communication prioritization**

1. Data Sharing and Privacy

- Establish national guidelines for secure collection, sharing, storage, anonymization, and retention of V2X data in line with the Digital Personal Data Protection Act 2023.
- Define clear responsibilities for automobile manufacturers, telecom operators, cloud providers, and government agencies regarding consent management, lawful data access, and privacy protection.

2. Cybersecurity for V2X Systems

- Mandate cybersecurity-by-design practices for connected vehicles, including secure boot, encryption, authentication, OTA update security, and continuous vulnerability assessment aligned with International Organization for Standardization / SAE International ISO/SAE 21434 and UNECE WP.29.
- Establish indigenous automotive cybersecurity testing labs, certification frameworks, Automotive Security Operations Centres (Auto-SOCs), and national incident reporting mechanisms for connected mobility systems.

3. Safety-Critical Communication Prioritization

- Allocate dedicated and protected communication resources for emergency and safety-critical V2X messages with guaranteed low latency and high reliability over 5G/6G networks.
- Develop national operational standards for fail-safe communication, emergency message prioritization, and interoperability among vehicles, roadside infrastructure, telecom networks, and emergency response agencies.

Q21. What should be the appropriate entry fee for V2I communication service authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

No entry fees or nominal entry fees for administrative overhead of keeping track of RSUs.

Q22. What should be the appropriate terms and conditions for bank guarantees for the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

No bank guarantees since this is predominantly shared safety spectrum. RSU operation is shared and non-exclusive; the registry model focuses on compliance and enforcement rather than financial risk management.

Q23. What should be the applicable minimum equity and minimum net worth requirements for authorised entities under the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

No such prohibitive criteria, since this is predominantly shared safety spectrum. Such criteria would exclude legitimate public road authorities and smaller contractors implementing safety infrastructure. Eligibility for authorisation should be based on competence and accountability, not balance-sheet thresholds.

Q24. What should be the applicable application processing fee for the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

No fees, or nominal fees (if any) to ensure light-touch regulation in predominantly shared safety spectrum. If there is any nominal cost-recovery for RSU registration processing (online), the process should be automated

to the maximum extent.

Q25. What should be the applicable rate of authorisation fee for proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

No fees, or nominal fees (if any) to ensure light-touch regulation in predominantly shared safety spectrum. If there is any nominal cost-recovery for RSU authorization processing (online), the process should be automated to the maximum extent.

Q26. Apart from the financial provisions discussed earlier, are there any other financial terms and conditions that should be made applicable for the proposed V2I communication service authorisation? Please provide detailed justification in support of your response.

ITS India Response:

Additional financial terms should be avoided. If required, adopt fee waivers for government road-safety programmes and pilots, and ensure any cost-recovery fees are transparent, minimal, and strictly tied to registry/compliance operations.