

Future GST Revenue Growth in Kerala: A Data-Driven Framework Using Geospatial Business Intelligence, Government Data Integration and Vizhinjam Port-Led Economic Development

Dr. AjuSaigal

Senior Data Analyst

Tax Research & Policy Cell, GST Department, Government of Kerala, India

Abstract

The Goods and Services Tax (GST) is one of the primary sources of revenue for the State of Kerala. However, challenges such as revenue leakage, unregistered businesses, fake registrations, under-reporting of turnover, and fragmented government databases continue to affect revenue mobilization. At the same time, emerging opportunities such as Vizhinjam International Seaport, digital commerce, and data-driven governance offer significant potential for expanding the GST base and improving compliance. This study proposes a data-driven framework for enhancing future GST revenue growth in Kerala through Geospatial Business Intelligence, Government Data Integration, and Vizhinjam Port-led Economic Development. The research integrates multiple data sources, including GST registration records, KSMART Trade License data, Income Tax data, E-Way Bills, E-Invoices, electricity consumption records, property tax databases, and geo-mapped business establishment data to identify revenue leakages and compliance gaps. The study examines the role of Vizhinjam Port in creating new economic opportunities through logistics, warehousing, e-commerce, maritime services, and export-oriented activities. By integrating GIS, Big Data Analytics, Artificial Intelligence, and government databases, the proposed framework aims to enhance GST compliance, identify revenue leakages, detect unregistered businesses, and support data-driven policy decisions. The study is expected to contribute to sustainable GST revenue growth and the development of an intelligent revenue management system for Kerala.

Keywords: GST Revenue Growth, Kerala, Geospatial Business Intelligence, Vizhinjam Port, Data Integration, Revenue Leakage, Tax Compliance, GIS, Artificial Intelligence.

1. Introduction to GST Administration and Revenue Challenges in Kerala

The Goods and Services Tax (GST), introduced in India on 1 July 2017, represents a major reform in the indirect taxation system by replacing multiple central and state taxes with a unified tax structure. GST has become one of the primary sources of revenue for the State of Kerala, contributing significantly to public expenditure, infrastructure development, and welfare programmes.

Despite the steady growth in GST collections, Kerala faces several challenges in maximizing revenue potential. These challenges include revenue leakage, unregistered businesses, fake registrations, under-reporting of turnover, fraudulent input tax credit claims, and limited integration of government databases. The increasing complexity of economic activities and the growth of the digital economy require modern data-driven approaches for effective tax administration and compliance monitoring.

At the same time, Kerala is witnessing new economic opportunities through initiatives such as Vizhinjam International Seaport, digital commerce expansion, logistics infrastructure development, and e-Governance platforms such as KSMART. These developments generate large volumes of data that can be utilized to strengthen GST administration and improve revenue collection.

This study explores the potential of Geospatial Business Intelligence, Government Data Integration, Artificial

Intelligence, and Advanced Analytics in identifying revenue leakages, detecting non-compliant taxpayers, and expanding the GST base. The research also examines the role of Vizhinjam Port-led economic development in creating new taxable economic activities and enhancing future GST revenue growth in Kerala.

2. Literature Review on Tax Analytics, GIS, AI and Revenue Intelligence Systems

Recent studies in tax administration highlight the growing importance of data analytics, Geographic Information Systems (GIS), Artificial Intelligence (AI), and Revenue Intelligence Systems in improving tax compliance and revenue collection. Governments across the world are increasingly adopting advanced analytical tools to identify tax evasion, detect fraudulent transactions, and enhance decision-making through evidence-based governance.

Tax Analytics enables the examination of large volumes of taxpayer data to identify compliance risks, revenue leakages, and hidden economic activities. GIS technology has emerged as a powerful tool for mapping business locations, detecting unregistered establishments, and supporting location-based tax intelligence. Similarly, Artificial Intelligence and Machine Learning techniques are being utilized to develop risk scoring models, predict taxpayer behaviour, and identify anomalies in tax returns and transaction data. Several studies have emphasized the benefits of integrating tax data with external databases such as business registrations, trade licenses, customs records, property tax records, and utility consumption data. Such integrated approaches improve transparency, strengthen enforcement mechanisms, and facilitate targeted compliance interventions.

The literature further indicates that Revenue Intelligence Systems supported by Big Data Analytics can significantly enhance tax administration efficiency. However, limited research has been conducted on integrating Geospatial Business Intelligence, Government Data Integration, and Port-Led Economic Development within the GST ecosystem. This study seeks to address this research gap by proposing a comprehensive framework for future GST revenue growth in Kerala using advanced analytical technologies and integrated data-driven governance.

3. GST Revenue Scenario and Economic Landscape of Kerala

Kerala has witnessed consistent growth in GST collections since the introduction of the Goods and Services Tax in 2017, making it one of the major sources of state revenue. The state's economy is predominantly driven by trade, services, tourism, construction, healthcare, information technology, and small and medium enterprises. Major contributors to GST revenue include wholesale and retail trade, construction materials, textiles, jewellery, hospitality, transportation, and service-related sectors.

Despite steady revenue growth, significant opportunities remain for expanding the tax base through improved compliance monitoring and identification of unregistered businesses. Variations in taxpayer density, economic activity, and revenue contribution across districts indicate the need for data-driven approaches to revenue administration. Emerging economic drivers such as Vizhinjam International Seaport, logistics infrastructure, e-commerce expansion, and digital business ecosystems are expected to create new taxable activities and enhance future GST collections. The analysis of Kerala's GST revenue trends helps identify sectors that contribute significantly to state revenue and sectors that possess untapped tax potential. Understanding taxpayer distribution, business activity patterns, and economic growth indicators enables the GST Department to adopt a data-driven approach for revenue enhancement and compliance management.

For example, if a district has 10,000 geo-mapped business establishments but only 6,500 active GST registrations, the remaining establishments may indicate potential unregistered businesses, composition taxpayers exceeding threshold limits, or businesses operating outside the formal tax system. Similarly, a sector showing high electricity consumption, large-scale goods movement, and substantial commercial activity but low GST turnover may indicate possible revenue leakage or under-reporting.

Sector-Wise GST Revenue Potential in Kerala

Sector	Current GST Contribution	Future Growth Potential	Revenue Opportunity
Wholesale & Retail Trade	Very High	High	Compliance Monitoring
Textile & Garment Trade	High	Very High	Identification of Unregistered Dealers
Jewellery Sector	High	Very High	Turnover Verification and Compliance Analytics
Construction Materials	High	High	E-Way Bill and Supply Chain Analytics
E-Commerce & Online Trade	Medium	Very High	Data Integration and Digital Commerce Monitoring
Logistics & Warehousing	Medium	Very High	Vizhinjam Port-Led Growth Opportunities
Tourism & Hospitality	High	Very High	Digital Transaction and Service Analytics
Healthcare Supply Chain	Medium	High	Vendor Network and Procurement Analytics
Maritime Services	Low	Very High	Port-Led Economic Development
Export Processing Units	Low	Very High	New GST Registrations and Export Ecosystem Growth

Data-Driven Revenue Identification Framework

Data Source	Observation	Potential Action
KSMART Trade License Data	Active business establishment identified	Verify GST Registration Status
Geo-Mapped Business Data	Commercial establishment identified through GIS	Registration Compliance Verification
Electricity Consumption Data	High power consumption with low GST turnover	Compare with Reported Sales Turnover
E-Way Bill Data	Significant movement of goods	Verify GST Returns and Tax Payments

Income Tax Data	High income or business receipts reported	Match with GST Turnover and Returns
Property Tax Data	Commercial property identified	Verify Business Activity and Registration
E-Invoice Data	High-value transactions reported	Cross-check GST Compliance
Customs Import/Export Data	Import-export activity identified	Verify GST Registration and Tax Reporting
Port Cargo Data	Cargo movement through Vizhinjam Port	Identify Logistics and Supply Chain Businesses
Business Registration Data	Newly registered businesses identified	Ensure GST Registration Compliance

The analysis indicates that Vizhinjam Port-led logistics activities, warehousing hubs, e-commerce distribution centres, maritime services, cruise tourism, export processing zones, textile clusters, jewellery trade, and digital commerce ecosystems are likely to become major drivers of GST revenue growth in Kerala. By integrating GST data with KSMART, Income Tax, Geo-Spatial Business Intelligence, E-Way Bills, and other government databases, the State GST Department can identify untapped revenue opportunities, reduce revenue leakages, and strengthen tax compliance.

The findings provide the foundation for developing a modern GST Revenue Intelligence Framework capable of supporting evidence-based decision-making, targeted enforcement actions, and sustainable revenue growth in Kerala.

4. Geospatial Business Intelligence Framework for GST Administration

Geospatial Business Intelligence (GBI) provides an innovative approach to strengthening GST administration through the integration of geographic information and taxpayer data. The framework utilizes geo-mapped business establishment data obtained from satellite imagery, Google Business listings, trade license databases, electricity consumption records, and other location-based datasets to support revenue intelligence and compliance monitoring. By comparing these datasets with GST registration records, tax authorities can identify unregistered businesses, inactive taxpayers, under-reported turnover, and potential compliance gaps.

The framework leverages Geographic Information Systems (GIS), location analytics, and spatial data visualization to create a comprehensive business intelligence platform for tax administration. The integration of geospatial data with GST databases enables authorities to detect hidden economic activities, improve taxpayer coverage, and enhance enforcement efficiency. The proposed model supports evidence-based decision-making and provides a scalable solution for expanding the tax base and improving GST revenue collection in Kerala.

Geospatial Analysis

Business Category	GST Registration Status	Observation	Suggested Action
Textile Wholesale Unit	Not Registered	Active commercial establishment identified through GIS	Registration Verification
Jewellery Showroom	Registered	High business visibility with comparatively low turnover reporting	Turnover Analysis
Restaurant Chain Outlet	Not Found in GST Database	Active operation identified through geo-mapping	Compliance Inspection
Warehouse Facility	Registered	Large commercial facility with low tax reporting	Business Verification
Mobile Phone Store	Not Registered	Listed in trade license and online business databases	Registration Enforcement
Construction Material Dealer	Registered	Significant goods movement with low GST turnover	Risk-Based Audit
E-Commerce Fulfilment Centre	Not Registered	Commercial logistics activity identified	GST Registration Verification

Expected Sample Findings from Geospatial Business Intelligence Analysis

Parameter Analysed	Total Identified	GST Registered	Potential Non-Compliant Cases
Geo-Mapped Businesses	10,000	7,200	2,800
Trade License Holders	8,500	6,900	1,600
Google Business Listings	12,000	8,100	3,900
Commercial Buildings	5,000	3,950	1,050
High Electricity Consumption Units	2,000	1,450	550

The analysis demonstrates that geospatial intelligence can effectively identify gaps between actual business activity and GST registration records. The findings indicate significant opportunities for expanding the taxpayer base, improving compliance monitoring, reducing revenue leakages, and strengthening data-driven GST administration. The framework can serve as a foundation for developing a statewide GST Revenue Intelligence Platform capable of supporting sustainable revenue growth and evidence-based tax governance in Kerala.

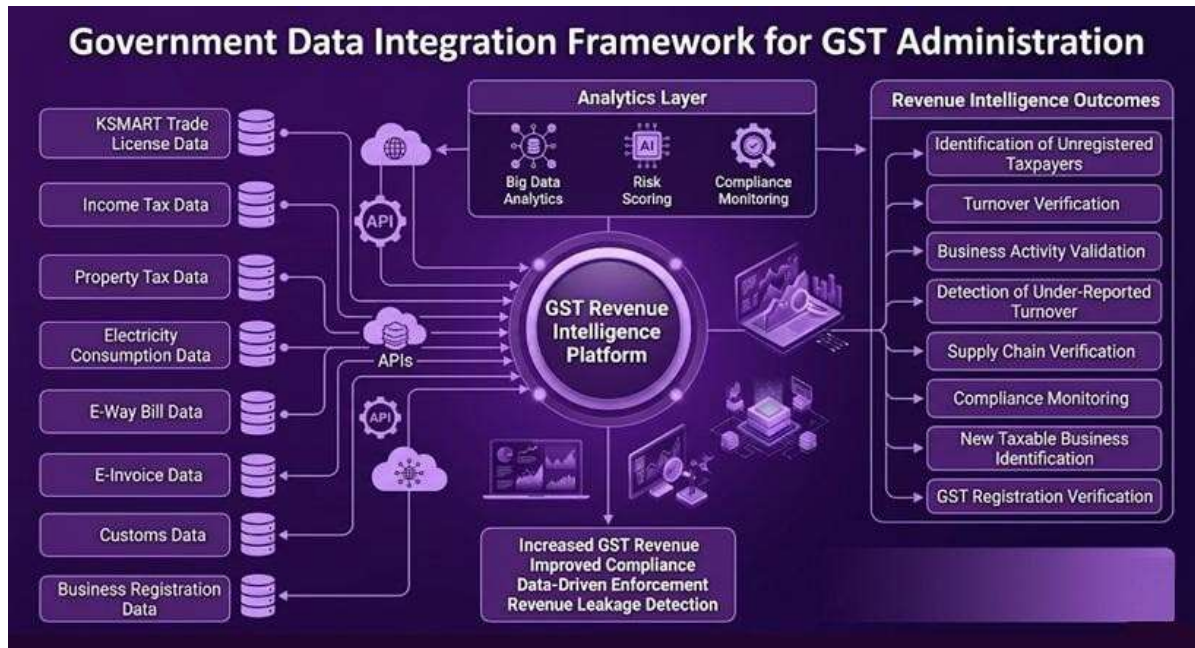
5. Government Data Integration for Revenue Enhancement

Government Data Integration plays a crucial role in modernizing GST administration and identifying untapped revenue opportunities. The proposed framework integrates GST data with KSMART Trade License records, Income Tax data, Property Tax databases, Electricity Consumption records, E-Way Bills, E-Invoices, Customs information, and Business Registration databases to create a unified revenue intelligence ecosystem. By cross-verifying these datasets, tax authorities can identify unregistered businesses, under-reported turnover, inactive taxpayers, and potential revenue leakages.

The framework supports taxpayer profiling, risk assessment, compliance monitoring, and evidence-based decision-making through advanced analytics and inter-departmental data sharing. The integration of multiple government databases provides a comprehensive view of economic activities across Kerala and enables targeted enforcement actions. The approach is expected to strengthen tax compliance, improve revenue administration, and support sustainable GST revenue growth.

Government Data Integration Framework for GST Administration

Data Source	Key Information Available	Revenue Intelligence Outcome
KSMART Trade License Data	Licensed Business Establishments	Identification of Unregistered Taxpayers
Income Tax Data	Business Income and Financial Information	Turnover Verification
Property Tax Data	Commercial Property Ownership	Business Activity Validation
Electricity Consumption Data	Power Usage Patterns	Detection of Under-Reported Business Activity
E-Way Bill Data	Goods Movement Information	Supply Chain Verification
E-Invoice Data	High-Value Business Transactions	Compliance Monitoring
Customs Data	Import and Export Activities	Identification of New Taxable Businesses
Business Registration Data	Newly Registered Enterprises	GST Registration Verification

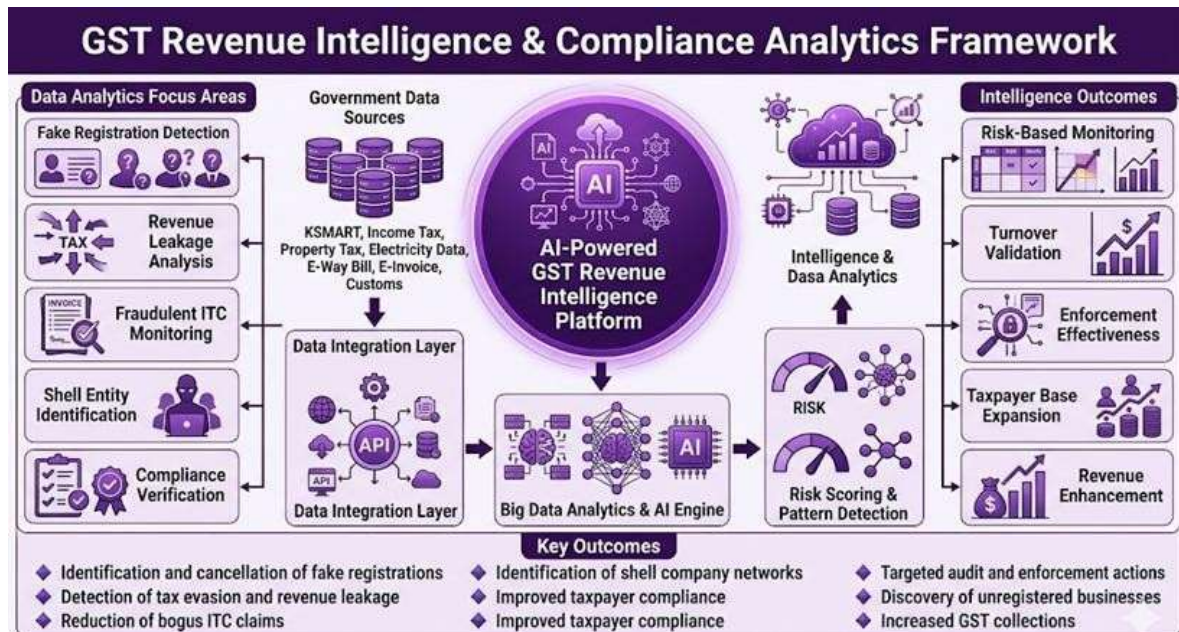


The implementation of an integrated Government Data Framework can significantly improve GST compliance management, reduce revenue leakages, expand the taxpayer base, and establish a technology-driven revenue intelligence ecosystem for Kerala.

6. Revenue Leakage Detection and Fake Registration Identification

Revenue leakage and fake registrations continue to pose significant challenges to GST administration, resulting in loss of revenue and reduced compliance efficiency. The increasing complexity of business transactions, digital commerce, and supply chain networks necessitates the adoption of advanced analytical approaches to identify fraudulent activities and strengthen tax governance.

This study proposes a Revenue Leakage Detection and Fake Registration Identification Framework that leverages data analytics, artificial intelligence, risk profiling, and cross-database validation techniques to identify suspicious taxpayer behavior. The framework focuses on detecting fake registrations, shell entities, bogus invoicing, fraudulent Input Tax Credit (ITC) claims, under-reported turnover, and other forms of tax evasion. By integrating GST data with geospatial business intelligence, government databases, transaction records, and economic indicators, the framework enables the identification of anomalies and high-risk taxpayers requiring further verification.



The proposed model supports proactive compliance management through automated risk assessment and intelligence-based monitoring. It facilitates the early detection of revenue leakages, improves taxpayer verification processes, and enhances the effectiveness of enforcement activities. The framework also contributes to the identification of businesses operating outside the formal tax system and assists in expanding the GST taxpayer base.

The implementation of a data-driven revenue intelligence framework is expected to strengthen compliance monitoring, improve fraud detection capabilities, reduce revenue leakages, and support sustainable GST revenue growth in Kerala. By adopting technology-enabled governance and integrated analytics, the GST administration can transition from reactive enforcement to proactive and intelligence-led tax management.

Expected Outcomes of Revenue Leakage Detection Framework

Focus Area	Expected Outcome
Fake Registration Detection	Identification and cancellation of non-genuine registrations
Revenue Leakage Analysis	Improved detection of tax evasion patterns
Fraudulent ITC Monitoring	Reduction in bogus ITC claims
Shell Entity Identification	Detection of suspicious business networks
Compliance Verification	Improved taxpayer compliance levels
Risk-Based Monitoring	Prioritization of high-risk taxpayers
Turnover Validation	Identification of under-reported sales
Enforcement Effectiveness	Targeted verification and audit actions
Taxpayer Base Expansion	Discovery of previously unregistered businesses
Revenue Enhancement	Increased GST collections and reduced leakage

7. Vizhinjam Port-Led Economic Development and GST Revenue Growth

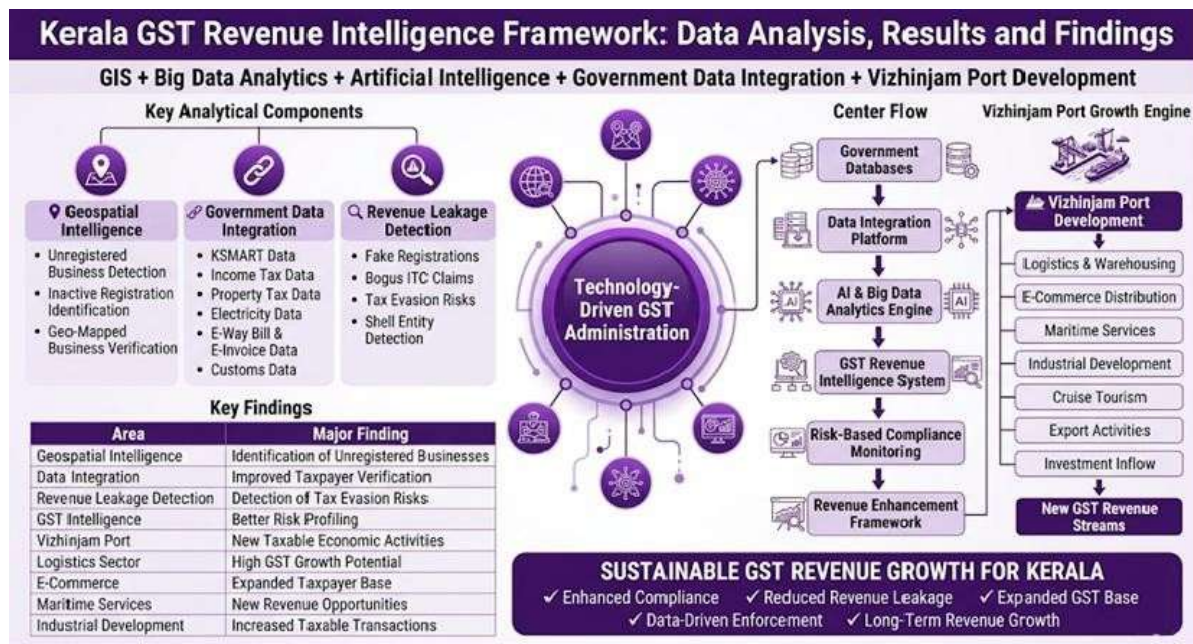
Vizhinjam International Seaport has the potential to become a major catalyst for economic growth and GST revenue enhancement in Kerala. Its strategic location near international shipping routes is expected to attract logistics, warehousing, maritime services, e-commerce distribution, cruise tourism, and port-based industrial investments. The resulting economic activities can create new business opportunities, increase GST registrations, expand the tax base, and strengthen the state's supply chain ecosystem. This study examines the role of Vizhinjam Port in supporting sustainable GST revenue growth, employment generation, investment attraction, and long-term economic development in Kerala.

Expected Findings and GST Revenue Opportunities

Area	Expected Finding	GST Revenue Impact
Logistics & Warehousing	Growth of logistics parks and storage facilities	Increase in GST registrations and taxable services
E-Commerce Distribution	Establishment of fulfilment and distribution centres	Higher B2B and B2C GST collections
Maritime Services	Expansion of ship support and port-related services	New GST revenue streams
Industrial Development	Growth of port-based manufacturing units	Increased taxable turnover
Cruise Tourism	Rise in tourism and hospitality activities	Additional GST from hotels, restaurants and travel services
Investment Inflow	Attraction of domestic and foreign investments	Expansion of the GST taxpayer base
Employment Generation	Creation of direct and indirect jobs	Increased consumption-driven GST revenue
Supply Chain Ecosystem	Development of ancillary business activities	Sustainable long-term GST growth
Export-Oriented Activities	Growth of export processing and logistics services	Expansion of taxable support services
Overall Economic Impact	Emergence of Vizhinjam as a maritime and logistics hub	Significant future GST revenue growth for Kerala

8. Data Analysis, Results and Findings

The analysis demonstrates that integrating Geospatial Business Intelligence, Government Data Integration, Revenue Leakage Detection mechanisms, and Vizhinjam Port-led economic development can significantly strengthen GST administration in Kerala. The study identified opportunities for expanding the taxpayer base through geo-mapped business verification, inter-departmental data sharing, and risk-based compliance monitoring.



The findings indicate that unregistered businesses, under-reported turnover, inactive registrations, and potential revenue leakages can be effectively identified using integrated analytics. The study also highlights Vizhinjam Port as a future growth engine capable of generating new GST revenue through logistics, warehousing, maritime services, e-commerce distribution, tourism, and industrial development.

Key Findings

Area	Major Finding
Geospatial Intelligence	Identification of unregistered and inactive businesses
Government Data Integration	Improved taxpayer verification and compliance monitoring
Revenue Leakage Detection	Detection of fake registrations and tax evasion risks
GST Revenue Intelligence	Better risk profiling and data-driven enforcement
Vizhinjam Port Development	Creation of new taxable economic activities
Logistics & Warehousing	High future GST revenue potential
E-Commerce Growth	Expansion of GST taxpayer base
Maritime Services	New GST revenue opportunities
Industrial Development	Increased taxable transactions
Overall Impact	Sustainable GST revenue growth for Kerala

The proposed Kerala GST Revenue Intelligence Framework demonstrates that technology-driven tax administration, supported by GIS, Big Data Analytics, Artificial Intelligence, Government Data Integration, and Vizhinjam Port-led economic growth, can enhance compliance, reduce revenue leakages, expand the GST base, and support long-term revenue growth in Kerala.

9. Policy Recommendations and Conclusion

This study recommends the establishment of a Kerala GST Revenue Intelligence Platform integrating GST, KSMART, Income Tax, Property Tax, Electricity Consumption, E-Way Bill, E-Invoice, Customs, and Geospatial Business Intelligence data to strengthen taxpayer monitoring, compliance management, and revenue forecasting.

The Government may adopt GIS-based business mapping, AI-driven risk profiling, and inter-departmental data sharing to identify unregistered businesses, detect revenue leakages, and improve taxpayer compliance. Effective utilization of CGST Act provisions relating to registration, scrutiny, enforcement, penalties, and prosecution can further strengthen GST administration.

The study also recommends leveraging Vizhinjam Port as a catalyst for logistics, warehousing, maritime services, e-commerce distribution, industrial development, and cruise tourism, thereby creating new taxable economic activities and expanding the GST base.

In conclusion, the integration of Geospatial Business Intelligence, Government Data Integration, Artificial Intelligence, and Vizhinjam Port-led Economic Development can support sustainable GST revenue growth, reduce revenue leakages, improve compliance, and enhance data-driven tax governance in Kerala.

10. References

1. Goods and Services Tax Network (GSTN) (2024). GST Statistics, Return Filing and Taxpayer Reports. GSTN.
2. Central Board of Indirect Taxes and Customs (2024). Annual Report and GST Administration Reports. Government of India.
3. Ministry of Finance (2024). GST Revenue Collection Reports and Economic Analysis. Government of India.
4. Government of Kerala (2024). Kerala GST Annual Administration Report. Thiruvananthapuram.
5. National Informatics Centre (2023). Digital Governance and Data Integration Frameworks for Public Administration.
6. United Nations (2022). Geospatial Information Management and Data-Driven Governance Frameworks.
7. Adani Ports and Special Economic Zone Ltd. (2024). Vizhinjam Port Development Reports and Economic Impact Assessments.
8. Kerala State Industrial Development Corporation (2024). Logistics Parks, Industrial Growth and Investment Promotion Reports.
9. Survey of India (2023). Geospatial Data Standards and GIS Applications in Governance.
10. NITI Aayog (2023). Artificial Intelligence for Governance and Public Sector Analytics.