WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal Homepage: www.ijrpr.com ISSN 2582-7421

Econlens AI: Discovering Hidden Regional Economic Opportunities and Bottlenecks Using Geospatial Data and Explainable AI

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Project website: https://econlens-ai-five.vercel.app/

ABSTRACT:

Regional economic development is influenced by people, *labour* demand, businesses, infrastructure, resources, satellite observations, and external conditions. These indicators are often distributed across separate sources and may be difficult to interpret together. EconLens AI is a GIS-powered economic intelligence concept designed to move from disconnected regional indicators to an integrated view of economic opportunity and possible bottlenecks. The project presentation frames its central question as whether a region has economic, social, infrastructure, and business assets that are not translating into observed economic activity.

The proposed workflow organizes data sources, prepares and aligns regional data, constructs potential and observed-activity indicators, and supports opportunity detection, bottleneck diagnosis, forecasting, and scenario analysis. The interface concept focuses on region selection, geospatial analysis, economic insights, scenario simulation, reports, and an AI assistant. The project materials include illustrative dashboard and analytical examples; these should not be treated as verified measurements or validated model results without supporting datasets and evaluation. This paper documents the project concept, processing flow, system modules, dashboard design, opportunities, challenges, and future validation requirements.

Keywords: EconLens AI, GIS, regional economic intelligence, opportunity gap, bottleneck detection, geospatial analysis, forecasting, scenario analysis.

1. INTRODUCTION:

Economic potential is not always reflected in observed economic activity. A region may have a sizeable workforce, educational institutions, transport infrastructure, natural resources, or business assets, while employment and economic activity remain comparatively limited. EconLens AI frames this as an economic opportunity-gap problem: identifying where potential exists, what may be constraining activity, and what evidence can support further investigation.

The project presentation describes a GIS-powered platform that brings multiple data domains into one regional intelligence view. Its data universe includes people, infrastructure, satellite information, economic activity, labour demand, resources, and external conditions. By combining these domains, the platform aims to provide descriptive, diagnostic, predictive, and scenario-oriented insights for users exploring regional development.

2. RESEARCH QUESTION AND OBJECTIVES:

The project presentation states the central research question as whether AI can integrate socioeconomic, labour, infrastructure, business, and satellite data to identify regions with untapped economic potential and diagnose factors preventing that potential from becoming economic activity.

- Integrate relevant regional datasets from multiple domains into a common analytical view.
- Identify regions where potential indicators and observed activity appear mismatched.
- Investigate candidate constraints such as infrastructure access, skill mismatch, business density, and market access.
- Provide map-based regional insights and interpretable summaries.
- Explore forecasting and scenario analysis as decision-support capabilities.
- Present evidence and assumptions clearly so that illustrative outputs are not mistaken for validated findings.

3. DATA SOURCES AND DATA UNIVERSE:

The project presentation groups the information needed by EconLens AI into six broad domains. The exact dataset, geographic resolution, date range, licensing terms, and update frequency should be documented for every source used in an implementation.

People: Population, demographics, education, and workforce characteristics.

Infrastructure: Roads, connectivity, transport access, and other physical infrastructure. **Satellite:** Satellite-derived observations, including night-time-light information where suitable. **Economic activity:** Business activity, economic output, and regional economic indicators.

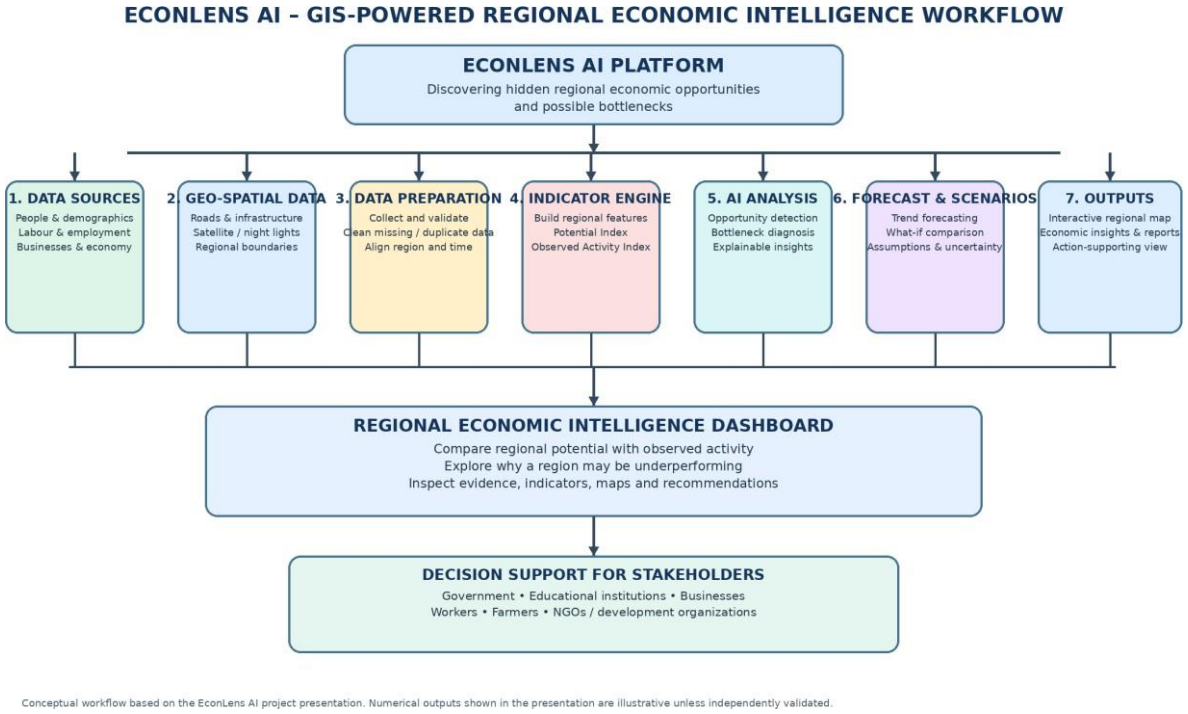
Labour demand: Employment, skills, workforce requirements, and possible skill mismatch.

Resources and external conditions: Natural or regional resources and relevant external conditions affecting economic activity.

4. METHODOLOGY AND PROCESSING:

The proposed processing workflow moves from data source identification to a regional intelligence dashboard. Data should be checked for completeness, consistency, geography, time coverage, and indicator meaning before indicators are compared. The system then organizes the selected measures into regional features and uses them for opportunity-gap analysis and subsequent diagnostic or scenario-oriented views.

Figure 1. EconLens AI processing workflow



Conceptual workflow based on the EconLens AI project presentation. Numerical outputs shown in the presentation are illustrative unless independently validated.

The workflow is conceptual and reflects the project presentation. It does not imply that every source has already been connected or that each analytical component has been experimentally validated.

5. OPPORTUNITY GAP AND AI FUNCTIONS:

The project presentation describes the economic opportunity gap as the difference between economic potential and actual or observed economic activity. A practical implementation must define the indicators, normalization, aggregation, weighting, and uncertainty handling used to calculate any numerical index. Until those choices are documented and validated, the concept should be used as an analytical framing rather than a verified score.

Opportunity detection: Highlights regions that may have untapped economic potential based on the selected regional indicators.

Bottleneck detection: Explores factors that may prevent potential from becoming economic activity. The project presentation gives examples including infrastructure access, skill mismatch, business density, and market access.

Forecasting: Explores how economic activity may evolve over time. Any forecast requires historical data, a defined target, model evaluation, and uncertainty reporting.

Scenario analysis: Allows comparison of hypothetical changes, such as improved last-mile connectivity. Scenario outputs depend on assumptions and should not be presented as guaranteed impacts.

6. SYSTEM MODULES AND USER INTERFACE:

The project presentation shows an EconLens AI interface concept with a region search and selection area, a navigation menu, a regional map, economic potential and observed activity summaries, possible bottlenecks, emerging skills, and an Ask EconLens interaction area. The navigation labels shown in the concept include Overview, Geospatial Analysis, Economic Insights, Scenario Simulator, Reports, and AI Assistant.

Figure 2. EconLens AI dashboard/interface concept reproduced from the supplied project presentation (page 12). This is a project visual, not an independently captured live website screenshot.



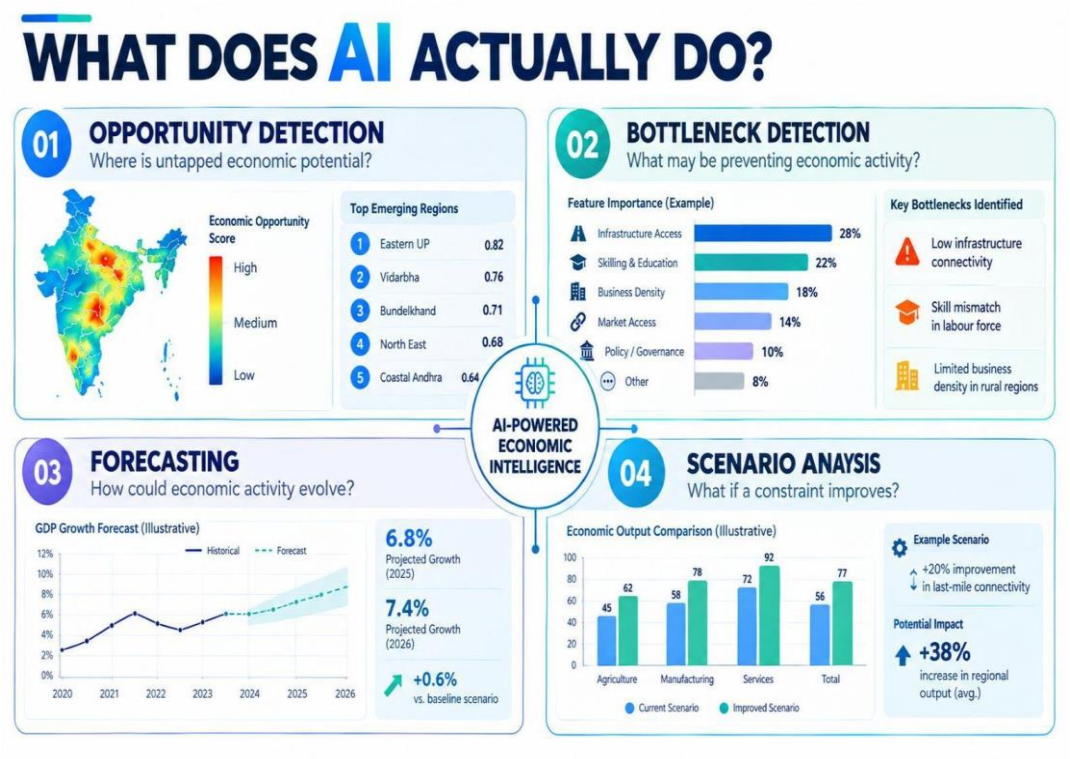
Overview: Provides a selected region and summary of key regional indicators. **Geospatial analysis:** Displays geographic patterns and regional comparisons on maps. **Economic insights:** Presents opportunity-related and observed-activity information.

Scenario simulator: Supports exploration of hypothetical changes and comparison with a baseline.

Reports: Provides a way to present or export regional findings.

AI assistant: Provides a conversational interface for questions about a selected region and its indicators.

Figure 3. AI analysis concepts shown in the supplied project presentation (page 9). Rankings, percentages, forecasts, and scenario values in this visual are illustrative examples, not verified results.



7. EXISTING APPROACH AND PROPOSED APPROACH:

Existing approach: Regional indicators may be reviewed separately across reports, portals, and datasets, requiring manual comparison and interpretation.

Proposed EconLens AI approach: A unified regional view is proposed to combine selected data domains, map regional patterns, compare potential-related indicators with observed activity, and support investigation of candidate bottlenecks.

8. OPPORTUNITIES AND APPLICATIONS:

Government and regional planners: Explore regional differences and identify areas that may need further assessment or investment study.

Educational institutions: Examine possible relationships between local skills, education, and labour demand.

Businesses: Explore regional market context, connectivity, and economic activity indicators.

Workers and communities: Understand emerging skills and possible regional employment patterns.

Development organizations and NGOs: Use a common evidence view to support discussion of regional development priorities.

9. CHALLENGES AND LIMITATIONS:

Data fragmentation: Sources may use different formats, definitions, geographic units, and reporting periods.

Data quality: Missing, outdated, biased, or incomplete data can affect regional comparisons.

Index construction: Indicator selection, normalization, and weighting may change the opportunity-gap result.

Causal interpretation: Feature importance or association does not establish that a factor causes an economic outcome.

Forecast uncertainty: Economic forecasts and scenario outputs depend on assumptions and may not reflect future conditions.

Validation: The project materials do not provide sufficient empirical evidence to claim model accuracy, verified rankings, or quantified economic impact.

10. CONCLUSION AND FUTURE WORK:

EconLens AI proposes a GIS-powered regional economic intelligence workflow that moves from disconnected indicators toward a combined view of potential, observed activity, and possible bottlenecks. Its main analytical functions are opportunity detection, bottleneck diagnosis, forecasting, and

scenario analysis, presented through a map-centred dashboard. The supplied project presentation illustrates the intended user experience and examples of analytical outputs.

Future work should document and connect the actual datasets, define reproducible indicator calculations, test geographic and temporal alignment, validate any predictive model on suitable held-out data, assess the stability of explanations, and evaluate the interface with intended users. All illustrative figures and scenario examples should be clearly distinguished from measured results. The project website is listed as https://econlens-ai-five.vercel.app/; the live page was not available for direct screenshot capture during preparation, so the included interface image is taken from the supplied project presentation.

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