STM JOURNALS

International Journal of
Land

https://journals.stmjournals.com/ijl

ISSN: 3107-6831
Volume 2, Issue 2, 2025
July–December
DOI (Journal): 10.37591/IJL

Research IJL

ECO Report Analys Achieving SDG 15

A. Sankaran[1,*], Kameshwaran S.[2], Aravind R.[3], Nandhakumaran T.[4], Bharan[5]

Abstract

This project creates automated data processing tool Eco Data Analyser for ecological data analysis for SDG 15: Life on Land conservation and biodiversity. File_picker, Excel, and CSV are used in the Flutter and Dart based cross-platform solution to assist environmental organizations in handling ecological data. Uploading ecological datasets, verifying data, classifying biodiversity indicators, and producing summary reports helps Eco Data Analyser to make conservation data accessible and valuable. User-defined parameters including region, habitat type, and species category guide processing of ecological data from Excel files. For geographical and time period comparisons, it standardizes data inputs to provide measuring unit and format consistency. Key tasks include species identification under risk, habitat biodiversity index computation, and data management including missing values. Data is exported and kept in CSV format via HTTP POST requests after processing to link with centralized databases for long-term monitoring and research. Eco Data Analyser generates ecological parameters and automates biodiversity reporting, therefore enhancing administrative efficiency and providing essential biodiversity health data for conservationists. Promoting data-driven decision-making for terrestrial ecosystem conservation and sustainability, this modular and scalable ecological data management system.

Keywords: Data analysis, long-term monitoring, modular design, data-driven decision making

INTRODUCTION

To protect terrestrial ecosystems, SDG 15 requires constant observation and evaluation of biodiversity health, species population, and ecological changes. Tracking development and spotting critical requirements calls for information gleaned from studies like habitat assessments and species assessments. Eco Data Analyser streamlines ecological data analysis across species richness, habitat quality, and conservation status. Using survey and environmental assessment data, this study tracks ecosystem health across multiple habitats using Eco Data Analyser. By means of region-wise and species-specific assessment, statistical analysis of biodiversity indicators, and report preparation, the software aids in the discovery of trends, evaluation of conservation priorities, and monitoring of human effects on biodiversity. By means of timely, reliable information to support habitat protection, restoration, and biodiversity preservation, we want to enable conservationists to accomplish SDG 15.

Methodology

The Eco Data Analyzer tool calls for data collecting, parsing, ecological metric conversion, data extraction, report generation and submission. These procedures help to monitor biodiversity effectively toward SDG 15 for life on land by means of data analysis.

Data Acquisition

Using the file_picker package XLSX and XLSR, conservationists may upload Excel ecological datasets including species populations, habitat data, and biodiversity metrics to the Eco Data Analyser tool. Following choice, the Excel package standardizes data for usage on mobile and web platforms.

***Author for Correspondence**
A. Sankaran
E-mail: vallirajendran75@gmail.com

[1-5]Research Scholar, Department of Multidisciplinary, Manakula Vinayagar Institute of Technology, Kalitheerthalkuppam, Puducherry, India

Received Date: July 29, 2025
Accepted Date: September 18, 2025
Published Date: September 27, 2025

Citation: A. Sankaran, Kameshwaran S., Aravind R., Nandhakumaran T., Bharan. ECO Report Analys Achieving SDG 15. International Journal of Land, 2025; 2(2): 1–10p.

Excel To Csv

Data function pulls species names, habitat types, and ecological measures from the Excel file. Using user-defined scales, the program evaluates or ranks ecosystem health iteratively over every dataset item. Data type and analytical needs will determine whether species abundance data becomes biodiversity indices or conservation status ratings.

Recognizing Threatened Species

Analyzing habitat fragmentation and population decline, the _extract Species. At Risk Data tool finds vulnerable species and ecosystems. If species meet risk criteria, entry data include species name, habitat, and risk factors. This helps to find species or areas needing immediate protection.

Distribution and Synthesis: To examine biodiversity throughout ecosystems, the tool counts species or ecological indicators across areas or habitats using the _calculate Biodiversity Counts feature. Furthermore tracked in _Generate Conservation Summary CSV are total species count, threatened species, protected populations, and areas of restoration. When summaries are exported to CSV, data is clear and ready for reference.

Turn in Data

Following computation and analysis, the application generates an HTTP POST request to a server endpoint. Data sent covers region, habitat type, species risk, biodiversity distribution, and conservation summary. Error handling provides comments on submission mistakes and protects data.

Components of the User Interface

Flutter widgets simplify the UI for the tool. Data submission and file upload choices as well as region and habitat type dropdowns help users navigate the process. Data input results in a confirmation screen.

Data Conversion for Interference List to Csv Converter's

CSV reports fit numerous systems and applications including several storage options. This includes at-risk species CSV files, biodiversity distribution, conservation summaries, and complete ecological metrics, therefore providing flexible and easily available data for conservation management and study Figure 1.

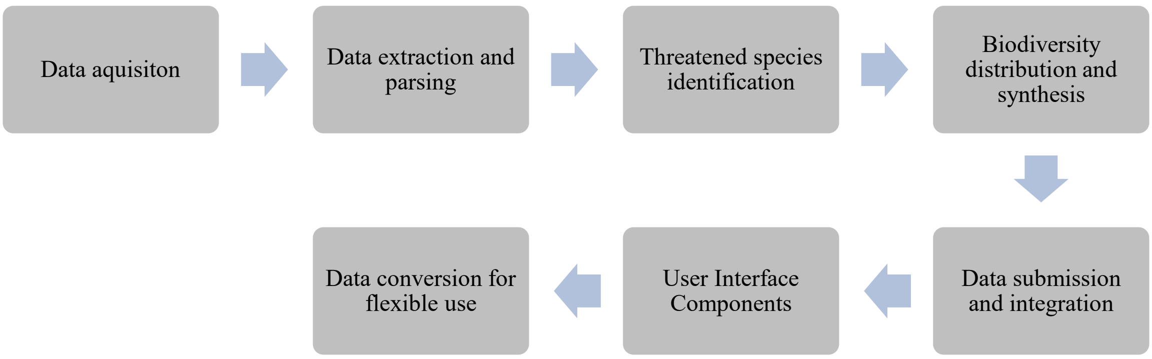

Figure 1. Architecture diagram.

PROPOSED SYSTEM

This is a suggested methodical approach for installing, assessing, and analyzing the Eco Data Analyser system to monitor biodiversity in compliance with Sustainable Development Goal 15 (Life on Land). The proposed Eco Data Analyzer for the surrounds

Data Acquisition

Standardized data on biodiversity and ecological systems from many various settings and species populations globally is much needed. Among other users, conservationists could input ecological data files in Excel formats (`.xlsx` and `.xls`. The `file_picker` program facilitates We therefore employ the

user upload feature. Standardizing data formats is feasible as the system reads the files using Excel parsing tools (`XLSX` and `XLSR%). Every single difference is recorded for further research. After processing Excel data, it is transformed into CSV to ensure interoperability on mobile and online platforms.

Data Extraction and Parsing

This initiative seeks to compile important ecological data for use in study. These include markers of biodiversity, habitat data, and species population. Data extraction methods help the system to find and gather basic ecological variables like species names, habitat classifications, and ecological measurements. Starting this first step, the process proceeds. The system evaluates ecological variables (like species population abundance) depending on user-defined scales in order to provide standardized biodiversity indices or conservation status ratings. Relevant biodiversity estimates for each dataset are computed in accordance with the particular analytical requirements. These actions, for example, cover species richness and population abundance.

Threatened Species Identification

The finding of endangered species marks third phase. This research aims to find fragile species and ecosystems at danger of destruction. The`_extract Species At Risk Data` tool is used within the context of criteria-based analysis to identify species defined by certain risk factors like habitat fragmentation or diminishing population. Part of the risk assessment process includes documenting pertinent information about any species that satisfies the risk criteria. This spans the species name, habitat, and related risk factors. The approach helps to highlight regions requiring preservation by alerting these species and ecosystems calling for quick conservation action.

Biodiversity Distribution and Synthesis

This study intends to investigate the species distribution and environmental condition in many surroundings. Regarding data aggregation, the system gathers information depending on habitat type, geographic area, or ecological indicators using the `_calculate Biodiversity Counts` capability. The system compiles statistics including the total count of species, the number of threatened species, protected populations, and approved restoration sites under the "Summary Generation". Using the {Generate Conservation Summary CSV} method allows one to export summaries to a CSV file. This makes the data readily accessible for use in reference or further investigation.

Data Submission and Integration

Uploading processed data to an external site aims to support more general conservation initiatives. Following data analysis, the software will create a POST request with significant data fields like the area, the habitat type, the species risk, the biodiversity distribution, and the conservation summary. Should data transfer prove to be problematic, the system will provide feedback to ensure the confidentiality and integrity of the data while it is in transit.

User Interface Components

This project aims to provide a simple and efficient data interaction user interface (UI). The system uses Flutter to provide users simple options for uploading files, dropdown menus for choosing the kind of habitat and location, and submit buttons. Following user data entry, the user is shown a confirmation page to indicate that their data submission went well.

Data Conversion for Flexible Use

The aim is to increase the availability of ecological data across many systems and uses. Reports are generated as CSV files so as to guarantee compatibility. Lists of threatened species, biodiversity distribution, descriptions of conservation initiatives, and ecological indicators are among these files. The **InterferenceListToCsvConverter** allows academics and policy-makers some degree of flexibility by enabling the integration of data with many conservation management tools and databases.

RELATED WORK

Problems in education, technology, and data analysis have been solved using several approaches. Although it ignores technical scalability, qualitative analysis helps assessment to match institutional goals for improvement of education [1]. Empirical studies challenge the relevance of self-assessment in learning and psychological development but find difficulties to generalize [2]. While theoretical frameworks explain formative and summative assessments without case studies [3], case studies mostly focus on higher education formative assessment processes with limited application [4]. While lacking sophisticated scenarios, framework-based Flutter and Dart creation and exploration let [5,6] beginning to intermediate developers create cross-platform programs. While lacking sophisticated scenarios, framework-based Flutter and Dart creation and exploration let beginning to intermediate developers create cross-platform programs. Although directed self-placement is not scalable [7], it enhances technical learning by means of workshops and self-assessment. Online learning systems [8] and classification algorithms [9] demonstrate trends and performance; accuracy and overfitting remain problems nonetheless. While big data analytics helps academic evaluation but generates privacy issues, knowledge graph development [10-11] offers ordered research representations but requires major computational resources. Although summary approaches [13] miss objective essential knowledge, HTTP flow analysis [12] indicates user behavior but fails with encrypted data. While Flutter recipe-based problem-solving [15] gives functional responses with minimum explanation, data-driven decision-making systems [14] maximize decisions but need professional interpretation.[16]

EVALUATION

Evaluation of System Performance

Data Processing Efficiency: An key component of data processing efficiency is evaluation of the time needed to upload, examine, and process vast amounts of data.

Error Rate in Data Parsing: Keeping track of the number of errors or inconsistencies found during the data processing process helps one assess the dependability of the data.

System Responsiveness: Testing the speed at which data is uploaded, processed, and reports are produced across a range of network conditions and device sorts helps one assess the responsiveness of the system.

Accuracy of Ecological Metrics

Metric Validation: Cross-checking the predicted biodiversity indices with established metrics or human calculations helps one to verify their validity.

Risk Assessment Precision: Comparing the list of species identified as under threat with the conservation assessments helps one to confirm the veracity of the risk assessment.

User experience testing

UI/UX Evaluation: User testing helps one assess the overall responsiveness of the user interface, the ease of use, the attractiveness of the data submission and file uploading procedures, and their general simplicity.

User Satisfaction Surveys: Gathering comments from data analysts and conservationists can help one ascertain whether or if there are any usability improvements.

Case Study Analysis

Example Study 1: Stable Habitat (Habitat A)

Initial Findings: Based on early results, consistent biodiversity index with low population variations.

Post-Analysis: The studies show a high species richness and a consistent health index, both of which might be related to the great conservation strategies used.

Example Study 2: Recovery Habitat (Habitat B)

Initial Findings: The initial results show a poor species diversity—just sixty percent of the expected species exist.

Post-Intervention: Restoration projects greatly expanded the range of species, therefore enabling the accomplishment of the established conservation goals.

Example Study 3: Degraded Habitat (Habitat C)

Initial Findings: Early results revealed quite high rates of species extinction, habitat destruction, and pollution.

Conservation Needs: The studies advise the incorporation of additional resources and continuous monitoring to help to sustain a stable biodiversity index by means of supplementary tools.

SCALABILITY AND DATA INTEROPERABILITY TESTING

Large Data Compatibility: Find out whether the system can effectively manage datasets growing steadily in scope.

Integration with External System: CSV exports should be fit for databases, storage systems, and external conservation tools. Process of integration with other systems calls for validation.

Long-term conservation impact assessment

Biodiversity Trends over Time: Use historical data to investigate biodiversity patterns and ascertain how changes in species count and habitat quality have come about over time.

Conservation Strategy Effectiveness: Comparing biodiversity indicators both before and after the use of conservation strategies helps one assess the effectiveness of the conservation policies. This is carried out to ascertain the long-term success of environmental preservation projects.

EXPERIMENTAL RESULTS

Evaluation of System Performance

Data Processing Efficiency

Objective: Measure time required to upload, parse and process large datasets.

Equation

$$T_{total}=T_{upload}+T_{parse}+T_{process}$$

Where:
- T_{upload}=Time taken to upload file
- T_{parse}=Time to parse and validate file
- $T_{process}$=Time to analyze and generate metrics

Example Calculation:
- Suppose we have a dataset of 100000 entries
- T_{upload}=5 seconds
- T_{parse}=20 seconds
- $T_{process}$=30 seconds
- Total Time T_{total}=5+20+30=55 seconds

Interpretation: An efficient system would minimize T_{total} even as data size grows.

Error Rate in Data Parsing

Objective: Track errors and inconsistencies to access reliability.

Equation:

$$\text{Error Rate}=\frac{\text{Number of Errors}}{\text{Total Errors}}\times 100\%$$

Example Calculation

- For a dataset with 10000 entries, if 50 inconsistencies are found:

  $$\text{Error Rate}=\frac{50}{10000}\times 100\%=0.5\%$$

  Interpretation: Lower error rates indicate higher data reliability and accuracy.

System Responsiveness

Objective: Measure response time for data upload, processing and report generarion across different conditions

Equations:

$R_{response}=T_{upload}+T_{parse}+T_{report}$ for different networks

Example Calculation

- *Network 1(High Speed):* $R_{response}$=55 seconds
- *Network 2(Medium Speed):* $R_{response}$=120 seconds
- *Network 3(Low Speed):* $R_{response}$=300 seconds

  Interpretation: By comparing response times across

  Networks, we determine the system's adaptability to varying connectivity levels.

Accuracy of Ecological Metrics

Metric Validation

- *Objective:* Cross-check biodiversity indices with manual calculations for accuracy.
- *Equation(Simpson's Diversity Index):*

  $$D=1-\frac{\sum(n\cdot(n-1))}{N\cdot(N-1)}$$

Where:

- n=Number of individuals of each species
- N=Total number of individuals of all species

Example Calculation

- For species counts of [10,20,30]:
  N=10+20+30=60

  $$D=1-\frac{10\cdot 9+20\cdot 19+30\cdot 29}{60\cdot 59}=1-\frac{870}{3540}\approx 0.754$$

Risk Assessment Precision

Objective: Validate the species risk list by comparing it with standard conservation assessments(e.g., IUCN Red List)

Equation:

$$\text{Precision} = \frac{\text{True Positives}}{\text{True Positives + False Positives}}$$

Example Calculation

- Assume 40 of 50 species flagged as "at risk" match the IUCN list:

$$\text{Precision} = \frac{40}{40+10} = 0.8 \; or \; 80\%$$

Interpretation: Higher precision suggests accurate identification of threatened species.

User Experience Testing

UI/UX Evaluation

Objective: Access ease of use, Interface Responsiveness and User Satisfaction.

Process

- *Metric:* Usability Score(out of 10) based on testing feedback.

Example Calculation

- Average rating from 20 users=8.5/10
  Interpretation: Scores closer to 10 indicate a user-friendly interface.

User Satisfactory Surveys

Objective: Collect qualitative feedback on functionality, ease of use, and design.

Case Study Analysis

Stable Habitat (Habitat A)

- *Initial Findings:* Consistent biodiversity index, low seasonal decline.
- *Equation:*

$$\text{Biodiversity Index(Mean)}=\frac{\sum D_i}{n}$$

- Example Calculation:
  For seasonal indices [0.75, 0.78, 0.76, 0.77]

$$\text{Mean Biodiversity Index}=\frac{0.75+0.78+0.76+0.77}{4}=0.765$$

Recovery Habitat (Habitat B)

- *Initial Findings:* Consistent biodiversity index, low seasonal decline.
- *Equation:*

$$\text{Recovery Rate}=\frac{\text{Species Post Restoration}}{\text{Species Pre Restoration}}$$

- Example Calculation:
  If species count rises from 60 to 100, the recovery rate as a percentage increase is calculated as:

$$\text{Recovery Rate(\% Increase)}=\frac{\text{Post Restoration Count-Pre Restoration}}{\text{Pre Restoration Count}}\times 100\%$$

Substituting the values:

$$\text{Recovery Rate(\% Increase)} = \frac{100-60}{60} \times 100\%$$

$$= \frac{40}{60} \times 100\% \approx 66.67\%$$

So, the species recovery rate is approximately 66.67% increase.

Degraded Habitat (Habitat C)

- *Conservation Needs:* High degradation, requiring monitoring and resources
- *Equation:*

$$\text{Decline Rate}=\frac{\text{Initial Index-Final Index}}{\text{Initial index}}$$

Scalability and Data Interoperability Testing

Large Data Compatibility

- *Objective:* Test processing times for large datasets.
- *Equation:*
  $T_{processing}$=f (data size)

Integration with External System

- *Objective:* Validate that CSV exports are accessible by external systems.

Long-Term Conservation Impact Assessment:

Biodiversity Trends Over Time

- *Equation:* Linear Regression for Trend Analysis

$$y=mx+b$$

where:

- y= Biodiversity index over time
- m= Slope of change
- b= Initial biodiversity index

Conservation Strategy Effectiveness

Equation: Pre/Post Conservation Comparison

$$\text{Effectiveness}=\frac{\text{Post Intervention Index-Pre Intervention Index}}{\text{Pre Intervention Index}}\times 100$$

Example Calculation

- Initial biodiversity index= 0.5, Post intervention index=0.75:

$$\text{Effectiveness}=\frac{0.75\text{-}0.5}{0.5}\times 100\%=50\%$$

Case Study

Ecological studies in Habitat A revealed a consistent biodiversity index throughout time, with stable species population across surveys. Habitat A's species richness and health indices remained high despite environmental sensitivity; just a little seasonal decline. Good conservation methods and significant community involvement in habitat protection show in a strong species population.

Targeted conservation projects helped Habitat B's biodiversity to be recovered. The first study revealed low species variety at 60% of expected species. Following operations in restoration and community engagement, species variety and abundance changed dramatically; the diversity index reached an amazing degree by the following analysis. As this trend shows, interventions help to promote ecological recovery and ecosystem stability. Among the researched areas, Habitat C exhibited the highest rates of species decline and habitat degradation. Underlying pollution and land-use changes as hazards, surveys revealed that the biodiversity index was less than half of the targeted conservation aims. The biological intricacy of this area, according to conservationists, calls for increased resources and continuous monitoring to protect delicate species and restore ecological equilibrium Figure 2.

Output

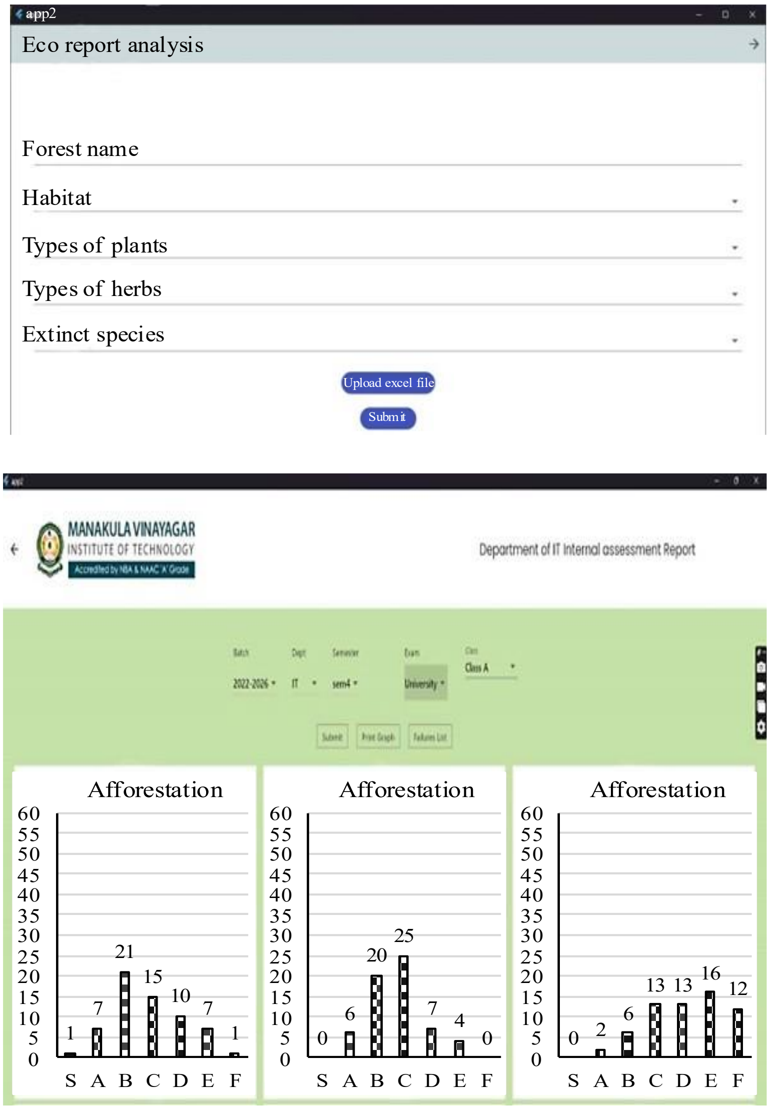

Figure 2. Output

CONCLUSION

This multi-layered study of student performance over tests emphasizes how internal and model tests help students be ready for final semester examinations. Subject-wise studies revealed themes like the necessity of extra resources in challenging subjects and the value of mock examinations in enhancing final outcomes. Subject B made much improvement thanks to regular assessments. Subject C's high failure rate, however, points to either additional instruction or curriculum modifications. These findings show the importance of ongoing assessment for raising student performance and identifying need for academic help. These insights might guide further research on the impact of educational innovations.

REFERENCES

1. A. W. Astin. Higher Education Assessment and Evaluation Philosophy and Practice: Assessment for Excellence Macmillan, ACE, 1993.
2. Brown, G. T. L. and Harris, L. R. Reevaluating Self-assessment as a Fundamental Classroom Competency Frontiers of Psychology, 516, 2014.
3. M. Taras. Theoretical Considerations on Formative and Summative Evaluation 53(4) British Journal of Educational Studies: 470–484, 2005.

4. M. Yorke. Higher Education Formative Assessment: Theory and Practice Improvement Higher Education 45(4):477–501, 2003.
5. Damodar Lohani, Taking Flutter to the Web: Learn how to build cross-platform UIs for web and mobile platforms using Flutter for Web, Packt Publishing, 2022.
6. Eric Windmill, Flutter in Action, Manning, 2020.
7. D. W. Parent, "A pilot study of a directed self-placement exam and a workshop designed to improve student learning outcomes in a junior level circuits and signals course," 2019.
8. P. Prasertisirikul, S. Laohakiat, R. Trakunphutthirak and S. Sukaphat, "A Predictive Model for Student Academic Performance in Online Learning System," 2022.
9. K. Bunkar, U. K. Singh, B. Pandya and R. Bunkar, "Data mining: Prediction for performance improvement of graduate students using classification," 2012.
10. T. Wang, Y. Wang and C. Tan, "Construction and Application of Knowledge Graph System in Computer Science," 2018.
11. W. Geng, "Research on Academic Evaluation of College Students Based on Big Data," 2019.
12. R. Sakurada, T. Moriya and J. Akahani, "Extracting user posting behavior using HTTP flow," 8th Asia-Pacific Symposium on Information and Telecommunication Technologies, Kuching, Malaysia, 2010,
13. G. Liu, "A Biased Summary System and Its Implementation Technology," 2008.
14. J. Lu, Z. Yan, J. Han and G. Zhang, "Data-Driven Decision-Making (D3M): Framework, Methodology, and Directions," in IEEE Transactions on Emerging Topics in Computational Intelligence, vol. 3, no. 4, pp. 286–296, Aug. 2019.
15. Simone Alessandria, Flutter Cookbook: 100+ step-by-step recipes for building cross-platform, professional-grade apps with Flutter 3.10.x and Dart 3.x, Packt Publishing, 2023.

