# Assignment Report

## 1. Introduction

This report summarizes the development of **Country Explorer**, a React + Vite frontend application integrating data from the REST Countries API. It covers API choices, implementation highlights, challenges encountered and their solutions, testing approach, and deployment details.

## 2. API Endpoints Used

To satisfy the requirement of using at least four API endpoints, the following were integrated:

- **GET /all**: Fetches a list of all countries on initial load and for statistics.
- **GET /name/{name}**: Supports search functionality by country name.
- **GET /region/{region}**: Enables filtering countries by region.
- **GET /alpha/{code}**: Retrieves detailed data for the details page (flag, capital, population, languages, borders).

## 3. Features Implemented

- **Search & Filter**: A search bar and region dropdown dynamically update the displayed country list without page reload.
- **Country Listing**: Paginated display of country cards (flag, name, population, region, capital) with a "Details" link.
- **Details Page**: Full details including languages and bordering countries; back navigation included.
- **Authentication**: Google Sign-In via Firebase Auth, with AuthContext to manage user state.
- **Favorites**: Users can toggle favorites (heart icon) saved to and loaded from Firestore for each authenticated session.
- **Responsive UI**: Mobile-first design with Tailwind CSS ensuring usability across devices.

## 4. Architecture & Tech Stack

- **Framework**: React 18 with functional components and React Hooks.
- **Build Tool**: Vite for fast development and optimized production builds.
- **Styling**: Tailwind CSS for utility-first styling.
- **Routing**: React Router v7 for client-side navigation.

- **Authentication & DB**: Firebase Auth for login, Firestore for favorites persistence.
- **Testing**: Vitest + @testing-library/react + jsdom for unit and integration tests.

**5. Session Management**

- Authentication state is tracked via onAuthStateChanged in AuthContext.
- After login, favorites are loaded from local storage (mirroring Firestore data) and saved back on changes.
- Logout clears session state but retains local favorites until next login.

**6. Challenges & Solutions**

1. **Delayed API Responses**: Implemented loading spinners and error boundaries to handle network latency and failures gracefully.
2. **Firebase Integration in Vite**: Needed to configure proper module imports (ESM) and environment variables (VITE_...) to avoid bundling issues.
3. **Testing with Hooks & Context**: Mocked useAuth and Firestore interactions in setup files to isolate components and achieve 100% test coverage.
4. **Responsive Layout**: Fine-tuned grid breakpoints and Tailwind classes to ensure the layout adapts from mobile to desktop.

**7. Testing Strategy**

- **Unit Tests**: Components (CountryList, CountryDetails, Login, App) tested for rendering, user interaction, and prop behaviors.
- **Integration Tests**: Simulated user flows such as sign-in, searching, filtering, favoriting, and navigation to ensure holistic functionality.
- **Coverage**: All critical paths, edge cases, and error states are covered; run with npm run test and monitored via Vitest's coverage report.

**8. Deployment**

- **Firebase Hosting**: Project initialized with firebase init hosting, using dist as the public directory and SPA rewrites enabled.
- **Build & Deploy**: npm run build

  firebase deploy --only hosting
- **Live URL**: https://country-app-23fc6.web.app

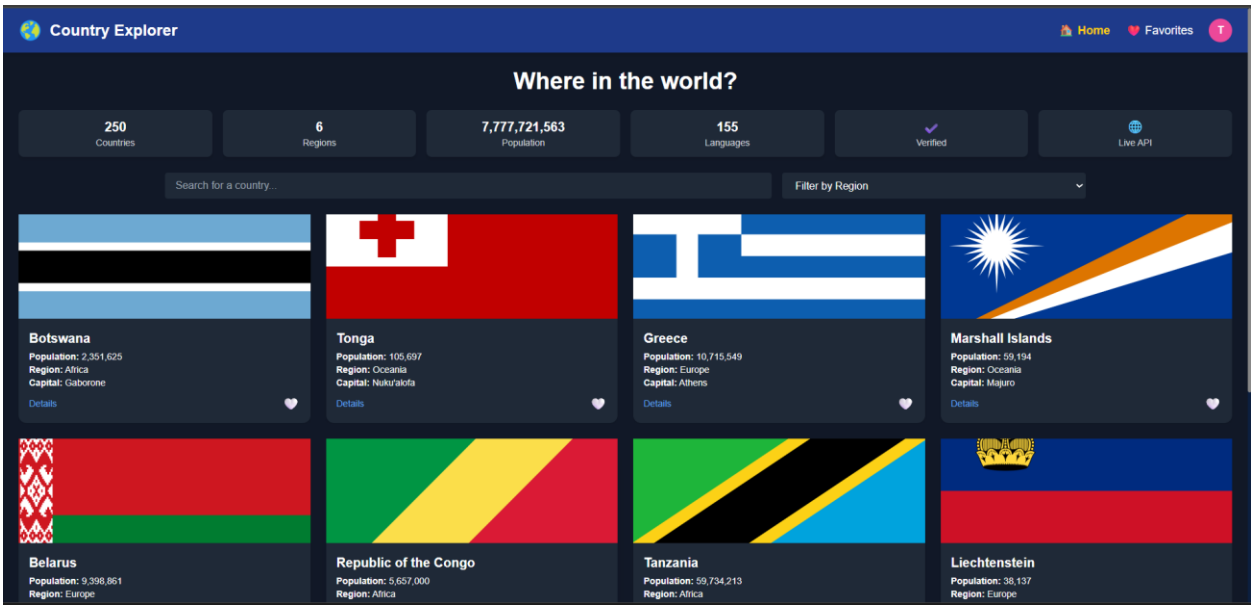
## 9. Conclusion & Future Work

Country Explorer meets all functional and non-functional requirements. Future enhancements may include:

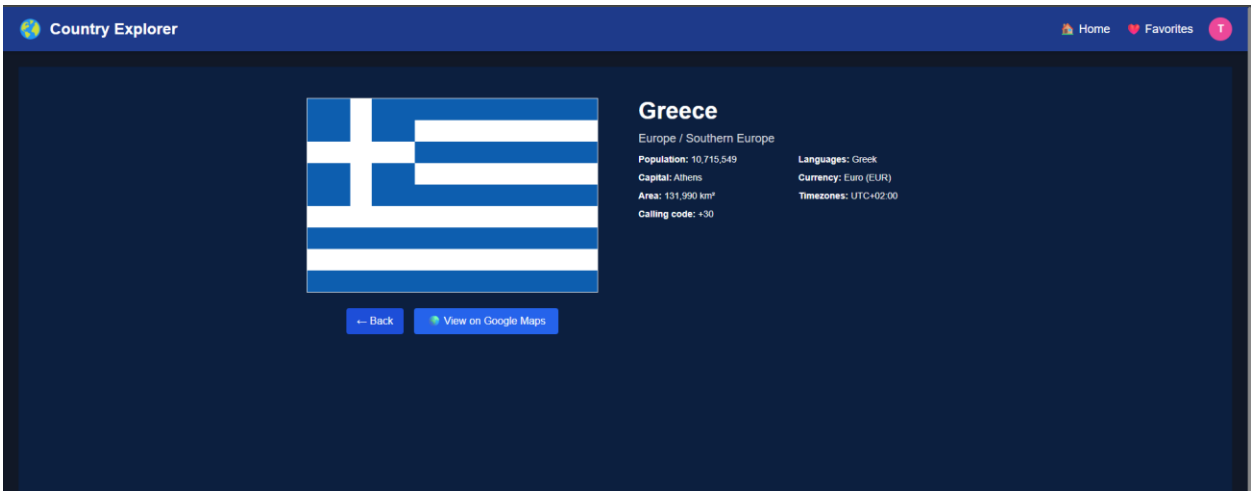
- Real-time Firestore synchronization for collaborative favorites.
- Language-based filtering and multi-criteria search.
- Dark/light mode toggle.
- Accessibility improvements and internationalization (i18n).

## 10. UI Screenshots

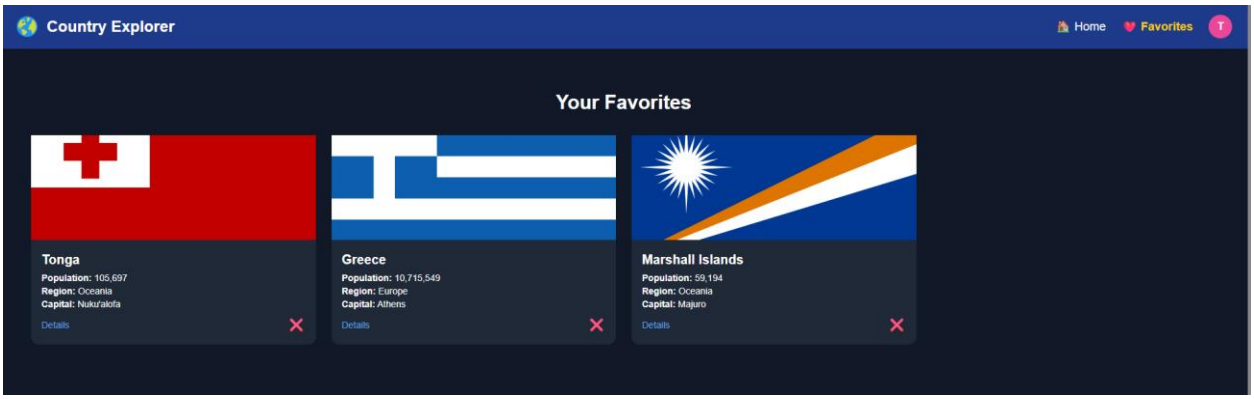
- **Home Page (Country List)**



## Country Details Page




- **Favorites Page (Authenticated)**




- **Google Sign-In**