

Technology & Architecture Planning Document

Topic: Transforming the Sustainability by Design Excel Tool into a Web Application
Date: April 6 – 9 (1 Introductory Session + A few days to submit work)
Time: 09.00 – 15:00
Location: Online (Link will be shared after the registration period)

Introduction of the ZEEUS Project

ZEEUS is an international initiative that strengthens innovation and entrepreneurship capacity within Higher Education Institutions (HEIs) by fostering sustainable, impact-driven venture creation. The project promotes innovation, knowledge transfer, and entrepreneurial education through transnational cooperation, supporting HEIs in responding effectively to societal and climate-related challenges.

Central to ZEEUS is the creation of a federated network of Seed Factories, with a strong Global North-to-Global South dimension. These Seed Factories will operate as one-stop shops for students, researchers, and staff, providing training, mentoring, ecosystem navigation, and access to funding opportunities. Their activities will channel academic talent toward the creation of innovative and sustainable ventures.

ZEEUS will also develop a novel climate impact assessment framework and tool to help entrepreneurs and institutions understand and measure the climate impacts of applied innovations. By strengthening partnerships between academia, industry, and public bodies, ZEEUS contributes to the twin Green and Digital transitions and creates scalable innovation ecosystems from Northern Europe to South Africa.

1. Purpose

The goal of this hackathon is to transform the existing **Excel-based Startup Sustainability Evaluation Tool** into a **fully functional web application** that:

- Implements all **Stage I (Inside-Out)** and **Stage II (Outside-In)** logic accurately.
- Provides a **dynamic dashboard** and visualizes material topics, risks, and opportunities.
- Generates PDF and CSV exports for reporting.
- Aligns with **UN SDGs** and **ESRS dual materiality standards**.
- Can be **deployed reliably in institutional or cloud environments**.

*Rationale: Moving from Excel to the web allows **scalability, multi-user access, auditability, and long-term adoption** in startup and corporate ecosystems.*

2. Architectural Principles

The web application will follow a **modular design** to ensure:

2.1 Separation of concerns:

- Frontend (UI) → handles user input, dashboard, visualizations
- Backend (API) → handles scoring engine and business logic
- Database → stores evaluations, scores, SDG mappings
- AI module (optional) → generates recommendations

- 2.2 **Deterministic scoring:** Calculations and logics must provide the Excel outputs exactly.
- 2.3 **Containerized deployment:** Using **Docker** to ensure reproducibility across different machines and environments.
- 2.4 **Security and compliance:** Input validation, HTTPS, role-based access, and auditability.
- 2.5 **Scalability:** Able to handle **thousands of evaluations**, multiple simultaneous users, and potentially multiple startups per account.

3. Recommended Technology Stack

Option A – TypeScript Full Stack (Recommended)

Frontend

- React + Next.js → server-side rendering for better performance
- TypeScript → improves reliability and reduces bugs
- TailwindCSS / Material UI → quick, modern UI development
- Chart.js / Recharts → dynamic dashboards

Backend

- Node.js (Express/NestJS)
- TypeScript → consistency across frontend/backend
- REST API → modular endpoints for evaluations, risks, SDGs, etc.

Database

- PostgreSQL → reliable relational DB, supports complex queries and indexing

Containerization

- Docker → ensures reproducible environments

Export

- React-PDF or Puppeteer → generate PDFs directly from dashboards

Option B – Python Stack (Optional)

Frontend: React, Vue, or Streamlit for rapid prototype

Backend: FastAPI or Django

Database: PostgreSQL or SQLite (prototype only)

Export: ReportLab / WeasyPrint

AI Integration: OpenAI API or HuggingFace models

*Rationale: Python is ideal if teams want to leverage **AI/ML for risk prediction or recommendation generation**.*

4. Core System Modules

- I. User & Evaluation Management**
 - Create / edit / delete evaluations
 - Save progress
 - Role-based access: user vs admin
 - Data persisted in DB
- II. Stage I – Impact Engine**
 - Implements **Economic, Environmental, Social, Governance** scoring
 - Environmental & Social formula:
 - $\text{Impact Score} = ((\text{Magnitude} + \text{Scale} + \text{Irreversibility}) / 3) \times \text{Likelihood}$
 - N/A = 0
 - Material topic flagged if ≥ 2
- III. Stage II – Risk & Opportunity Module**
 - Risks: Probability \times Impact \rightarrow mapped to rating 0–4
 - Opportunities: Likelihood \times Impact \rightarrow mapped to rating 0–4
 - Must visualize matrix (4x4 or color-coded)
- IV. SDG Alignment Module**
 - Maps Stage \rightarrow SDGs, NACE Division \rightarrow SDGs
 - Deduplicates and tags source (Stage / Business / Both)
 - Optional: expandable modal to show targets
- V. Dashboard & Visualization**
 - Scorecards (Financial, Environmental, Social, Governance)
 - Material topics highlighting
 - Risk & Opportunity graphs
 - Threshold line at score 2
- VI. Export System**
 - PDF full report
 - CSV / Excel raw data

5. Docker Usage

All submissions must be Dockerized:

- One container per module: frontend, backend, database
- All dependencies included (runtime, libraries, OS-level requirements)
- Startup via:

```
</> Code  
docker compose up
```

*Benefit: No environment issues; students, mentors, and production server run **exactly the same code**.*

6. AI Usage Guidelines

Permitted:

- Recommendation generation based on scoring outputs
- Summarizing SDGs or targets
- Natural language explanations in reports

Not permitted:

- Changing formula calculations
- Introducing non-deterministic outputs for scores

7. Database Schema (Minimum)

- Users
- Evaluations
- Stage I scores
- Stage II risks & opportunities
- SDG Mappings

8. Security Requirements

- HTTPS-ready
- Input validation & sanitization
- Password hashing & role separation
- Audit logs
- GDPR-compliant data handling if needed

9. Deployment Targets

- V-Space or Cloud (AWS / Azure / GCP)
- Dockerized services ready for production