Danki Impact Scoring

Methodology Whitepaper for Regulators and Investors

Nambona Yanguere — Danki Studio

2025-01-01

Table of contents

1 DANKI IMPACT SCORING

Methodology Whitepaper — Scoring Framework, Data Architecture & Validation

v1.0 · January 2025 · For analysts, compliance officers, regulators & LPs

---

2 Executive Summary

Danki Impact Scoring is a dual-layer scoring engine designed for impact investors who need to go beyond ESG compliance. It produces a composite impact score (0–100) for any investment project, covering 8 impact dimensions weighted toward social outcomes, with full regulatory compliance verification across 5 EU frameworks.

2.0.1 Key differentiators from ESG scoring:

- **Social-first philosophy**: Gender & Social Equity (20%) + Social Mobility (15%) + Governance (15%) = **50% of total weight** on social foundations
- **Social veto rule**: Projects scoring below 30 on Gender or Social Mobility are **capped at Amber** regardless of environmental performance
- **Regulatory completeness**: EU Taxonomy, SFDR (Art. 6/8/9), CSRD/ESRS, TCFD, MiFID II suitability — all checked automatically
- **Explainable by design**: Every score traces to a published formula and regulatory standard — zero black box

2.1 Why Not ESG?

ESG ratings measure **risk to the company from sustainability factors**. Impact scoring measures **the company's effect on the world**. These are fundamentally different questions.

A mining company with excellent ESG governance can still destroy communities. A solar farm with perfect environmental metrics can still exploit workers. ESG would score both highly. **Danki Impact Scoring would not.**

The social veto rule operationalises this distinction: no project achieves a Green band if it fails people, regardless of how well it treats the planet.

---

3 The Scoring Framework

3.1 Architecture Overview

```
                DANKI IMPACT SCORING
                Scoring Architecture


INPUT
   Project metadata (country, sector, asset class, size)
   8 dimension indicators (quantitative + qualitative)
   PAI values (GHG intensity, gender gap, corruption flag)
   SFDR classification intent (Art. 6 / 8 / 9)

LAYER 1 - Regulatory Compliance Gate
   EU Taxonomy: Substantial Contribution + DNSH
   SFDR: 18 mandatory PAI indicators
   CSRD/ESRS: Double materiality scope
   TCFD: Physical + transition risk
   MiFID II: Sustainability preference alignment

LAYER 2 - Impact Composite Score (0-100)
   8 weighted dimensions (social-first: 50% social weight)
   Social Veto Rule (Gender<30 OR Social<30 → Amber cap)
   Band assignment: Red / Amber / Green / Dark Green

LAYER 3 - ML Calibration (roadmap)
   XGBoost adjustment for country/sector/size interactions
   Trained on validated benchmark data

OUTPUT
   Composite score + band + radar chart
   Regulatory gate dashboard (pass/fail per framework)
   PAI traffic-light dashboard
   Warnings & strengths
   PDF due diligence report
```

3.2 The 8 Impact Dimensions

3.2.1 Social-First Weighting Philosophy

Academic literature (World Bank, UNDP, GIIN) consistently shows that social determinants are upstream of environmental outcomes. Gender equality is the single strongest predictor of long-term development. Social

mobility determines whether economic value stays in a territory. Governance is the multiplier — it either amplifies or destroys every other dimension.

The Danki principle: a solar farm built on grabbed land, staffed by imported labour, with a 40% gender pay gap is not impact. ESG would score it green. Danki would not.

Table 1: Danki Impact Scoring — Dimension Weights

Dimension	Weight	Key Indicators	Regulatory Basis
Gender & Social Equity	**20%**	Gender pay gap, board diversity, pay ratio, anti-discrimination policy	SFDR PAI 12–13, CSDDD Art. 3–7, IFC PS2
Social Mobility	**15%**	Local hiring %, living wage ratio, skills uplift, education access	OECD Guidelines Ch. V, SDG 1/4/8/10
Governance & Corruption	**15%**	Beneficial ownership transparency, AML flags, CPI score, sanctions	SFDR PAI 15–16, EU AML Directive 6
Climate & Environment	**18%**	GHG avoided, energy transition alignment, biodiversity net gain	EU Taxonomy Obj. 1–2, TCFD, SFDR PAI 1–6
Pollution & Health	**10%**	Scope 1–3 emissions, toxic exposure, air/soil quality	SFDR PAI 1–4, 8–9, EU Taxonomy Obj. 5
Water & Resources	**8%**	Water intensity, circular economy rate, waste	EU Taxonomy Obj. 3, SFDR PAI 7–8
Territory & Local Wealth	**8%**	Local GDP contribution, supply chain localisation, tax transparency	CSRD ESRS S3, OECD MNE Guidelines
Innovation & Resilience	**6%**	Tech transferability, employment durability, R&D intensity	EU Taxonomy Obj. 6, SDG 9

Social total: 50% (Gender 20% + Social Mobility 15% + Governance 15%) — **Environmental total: 36%** (Climate 18% + Pollution 10% + Water 8%) — **Economic total: 14%** (Territory 8% + Innovation 6%)

3.3 Social Veto Rule

> **!** Important
>
> **SOCIAL VETO**: If a project scores below 30/100 on Gender & Social Equity **OR** Social Mobility, the maximum achievable band is **Amber**, regardless of the composite score.
> A project scoring 85/100 overall but 25/100 on gender is capped at Amber with an explicit veto warning.

Regulatory basis for the veto:

- **SFDR PAI 12–13**: Gender pay gap and board gender diversity are mandatory disclosure indicators
- **CSDDD Art. 3–7**: Companies must identify, prevent and address adverse human rights impacts
- **IFC Performance Standard 2**: Labour and working conditions requirements for all IFC investments

- **OECD Guidelines for MNEs, Ch. V**: Employment and industrial relations standards

Implementation:

```
def _assign_band(composite: float, gender_dim: float, social_dim: float) -> tuple:
    veto = gender_dim < 30.0 or social_dim < 30.0
    if composite >= 75:
        raw_band = "Dark Green"
    elif composite >= 55:
        raw_band = "Green"
    elif composite >= 35:
        raw_band = "Amber"
    else:
        raw_band = "Red"

    if veto and raw_band in ("Dark Green", "Green"):
        return "Amber", True   # Capped
    return raw_band, veto and raw_band == "Amber"
```

3.4 Score Bands

Table 2: Score Band Decision Table

Band	Range	Meaning	SFDR Alignment
Dark Green	75–100	Exceptional positive impact across all dimensions	Article 9 eligible
Green	55–74	Meaningful positive impact, minor gaps	Article 8+ eligible
Amber	35–54	Mixed impact, significant improvement needed	Article 8 minimum / Article 6
Red	0–34	Net negative or negligible impact	Article 6 only

---

4 Dimension Scoring Formulas

Each dimension score is computed from observable indicators using transparent, auditable formulas. All scores are on a 0–100 scale.

4.1 Gender & Social Equity (20%)

$$G = \min\Big(100,\ 100 \times (1 - \text{gender\_pay\_gap}) \times \text{board\_diversity} \times \text{policy\_factor}\Big)$$

Where:

- `gender_pay_gap` $[0, 1]$: Ratio of pay gap (0 = no gap, 1 = complete gap)
- `board_diversity` $[0, 1]$: Proportion of women on board
- `policy_factor` $\{0.6, 0.8, 1.0\}$: Anti-discrimination policy strength (none / basic / comprehensive)

Score interpretation: A company with 0% pay gap, 50% board diversity and comprehensive policy scores ~50. To reach 80+, the company needs near-zero gap with majority-female leadership.

4.2 Social Mobility (15%)

$$S = \min\Big(100,\ 100 \times \text{local\_hire\_ratio} \times \text{living\_wage\_ratio} \times \text{skills\_factor}\Big)$$

Where:

- `local_hire_ratio` [0, 1]: Proportion of workforce hired locally
- `living_wage_ratio` [0.5, 2.0]: Ratio of median wage to local living wage
- `skills_factor` {0.6, 0.8, 1.0}: Skills uplift programme (none / basic / comprehensive)

4.3 Governance & Corruption (15%)

$$V = \min\Big(100,\ \text{CPI}_{country} \times \text{transparency\_factor} \times (1 - \text{sanctions\_flag})\Big)$$

Where:

- `CPI_country` [0, 100]: Transparency International Corruption Perceptions Index
- `transparency_factor` {0.5, 0.75, 1.0}: Beneficial ownership disclosure level
- `sanctions_flag` {0, 1}: Active sanctions or AML flags (binary penalty)

4.4 Climate & Environment (18%)

$$C = \min\Big(100,\ \text{taxonomy\_alignment} \times 100 \times \text{transition\_factor} \times (1 - \text{stranding\_risk})\Big)$$

Where:

- `taxonomy_alignment` [0, 1]: EU Taxonomy substantial contribution score
- `transition_factor` {0.6, 0.8, 1.0}: Energy transition pathway strength
- `stranding_risk` [0, 1]: Probability of asset stranding under 1.5°C scenario

4.5 Pollution & Health (10%)

$$P = \max\Big(0,\ 100 - (\text{emission\_intensity} \times 0.5) - (\text{toxic\_exposure} \times 30)\Big)$$

Where:

- `emission_intensity`: tCO e per €M revenue
- `toxic_exposure` {0, 1, 2, 3}: Categorical (none / low / medium / high)

4.6 Water & Resources (8%)

$$W = \max\Big(0,\ 100 - (\text{water\_intensity} \times 10) + (\text{circular\_rate} \times 30)\Big)$$

4.7 Territory & Local Wealth (8%)

$$T = \min\Big(100,\ \text{local\_procurement\_rate} \times 100 + \text{tax\_transparency} \times 20\Big)$$

4.8 Innovation & Resilience (6%)

$$I = \min\Big(100,\ \text{R\&D\_intensity} \times 500 + \text{tech\_transfer} \times 30 + \text{employment\_durability} \times 20\Big)$$

4.9 Composite Score

$$\text{Danki Score} = \sum_{d=1}^{8} w_d \times D_d$$

Where w_d are the dimension weights and D_d are the dimension scores. The composite is then subject to the social veto rule before band assignment.

---

5 Regulatory Framework Mapping

5.1 Layer 1 — Compliance Gates

Each investment is checked against 5 regulatory frameworks. The output is pass/fail with specific failure reasons.

5.2 EU Taxonomy (Regulation 2020/852)

Check	Logic	Source
Substantial Contribution	Climate score 60 AND sector is taxonomy-eligible	Art. 3, Delegated Acts
DNSH	No dimension below 25	Art. 17
Minimum Safeguards	Governance 40 AND Gender 40	Art. 18, OECD/ILO/UNGP

5.3 SFDR (Regulation 2019/2088)

Classification	Logic
Article 9	Composite 75 AND taxonomy aligned AND no veto
Article 8	Composite 45 AND taxonomy partially aligned
Article 6	All other products

5.4 CSRD/ESRS (Directive 2022/2464)

- **In scope**: Companies with 1,000 employees and €450M turnover (post-Omnibus, December 2025)
- **Out of scope projects**: Danki uses proxy data and reasonable estimates — a key differentiator vs. tools that require full CSRD disclosure

5.5 TCFD (FSB Recommendations)

- Physical risk: Country climate vulnerability × sector exposure
- Transition risk: Carbon intensity × 1.5°C scenario alignment

5.6 MiFID II Sustainability Preferences

- Taxonomy alignment percentage
- PAI consideration flag
- SFDR article classification

---

6 Exploratory Data Analysis

The following analysis is based on the synthetic benchmark dataset of 2,000 investment projects across 50 countries, 20 sectors and 6 asset classes.

---

7 ML Calibration Methodology

7.1 Approach: Composite Weighted Index with XGBoost Adjustment

The Danki scoring approach prioritises **explainability** — a requirement for regulatory acceptance (SFDR Art. 4, MiFID II suitability assessment). The ML layer is a calibration adjustment, not a replacement for the deterministic composite.

7.1.1 Why Composite First, ML Second

Table 5: ML Approach Comparison

Approach	Explainability	Regulatory Acceptance	Accuracy
Pure ML (black box)	Low	Rejected by AMF/EBA	High
Pure composite (no ML)	High	Accepted	Medium
Composite + ML calibration	**High**	**Accepted**	**High**

7.1.2 XGBoost Calibration Layer (Phase 3 Roadmap)

The ML layer adjusts the deterministic composite for interaction effects that linear weighting cannot capture:

1. **Country x Sector interactions**: Renewable energy in Norway vs. Nigeria has fundamentally different risk profiles that a country score alone doesn't capture
2. **Investment size non-linearity**: A EUR 1,500 microfinance project and a EUR 50M infrastructure project are scored on the same 0-100 scale but behave very differently
3. **Temporal calibration**: As benchmark data accumulates, the model recalibrates weights to reflect observed impact outcomes

Training pipeline:

```
Phase 3 Pipeline:
1. Validated benchmark dataset (2,000+ scored projects)
2. Feature engineering: dimension scores + country/sector/size interactions
3. XGBoost regressor: target = expert-validated Danki score
4. SHAP values for every prediction -> full explainability preserved
5. Human-in-the-loop: ML adjustment capped at +/- 10 points from composite
6. Quarterly retraining on new validated data
```

7.1.3 ML Architecture

7.2 Simulated Feature Importance

---

8 Data Sources

8.1 Public / Open Data Sources

Table 6: Public / Open Data Sources

Source	Data Provided	Coverage	Frequency	Access
Transparency International CPI	Country corruption perception index (0-100)	180 countries	Annual	Free
World Bank Open Data	GDP per capita, Gini, electricity access, education enrollment	217 countries	Annual	Free
ILO STAT	Gender pay gap, labour force participation, working conditions	189 countries	Annual	Free
UNDP HDI	Human Development Index, gender inequality index	191 countries	Annual	Free
ND-GAIN Index	Climate vulnerability and readiness scores	185 countries	Annual	Free
EU Taxonomy Compass	Taxonomy-eligible activities, technical screening criteria	EU	Ongoing	Free
EDGAR (JRC)	GHG emission inventories by country and sector	Global	Annual	Free
Global Living Wage Coalition	Living wage benchmarks by country/region	35+ countries	Annual	Free
OECD DAC	ODA flows, development finance statistics	180+ countries	Annual	Free
OpenSanctions	Sanctions lists, PEP data, enforcement actions	Global	Daily	Free
UN Comtrade	International trade data (supply chain localisation proxy)	200+ countries	Monthly	Free
Eurostat	EU employment, energy, environment statistics	EU-27	Quarterly	Free
SFDR PAI RTS Annex I	18 mandatory PAI indicator definitions and methodologies	EU regulation	Regulatory	Free
ESMA/EBA Joint PAI Report	Supervisory guidance on PAI indicator calculation	EU regulation	Annual	Free

8.2 Proprietary / Commercial Data Sources

Table 7: Proprietary / Commercial Data Sources

Source	Data Provided	Use Case	Approx. Cost/yr
MSCI ESG	ESG ratings, carbon data, PAI metrics, controversy scores	Benchmark calibration, PAI pre-fill	EUR 30k-100k
Sustainalytics	ESG risk ratings, carbon emissions, PAI indicators	Cross-validation	EUR 25k-80k
CDP	Corporate climate disclosures, water security, forests	Climate & water enrichment	EUR 5k-20k
Refinitiv ESG	630+ ESG metrics, controversies, carbon data	Large-cap coverage	EUR 20k-60k
Bloomberg ESG	ESG scores, supply chain data, governance metrics	Terminal-integrated scoring	Bloomberg Terminal
Preqin	PE/VC fund data, impact fund benchmarks	Private market calibration	EUR 15k-50k
S&P Trucost	Environmental cost data, carbon earnings at risk	Pollution & climate dimensions	EUR 20k-40k
RepRisk	ESG risk incidents, controversy tracking	Governance & corruption alerts	EUR 10k-30k
Clarity AI	Impact measurement, SDG alignment, PAI automation	Full PAI dashboard pre-fill	Custom
Moody's ESG	Climate risk, physical risk, transition risk scoring	TCFD compliance layer	EUR 15k-45k

Note

Danki v1.0 operates entirely on public data. The scoring engine requires only country-level indicators (CPI, HDI, climate vulnerability) plus project-level inputs from the user. Proprietary sources are optional enrichments for Phase 3 ML calibration and automated PAI pre-fill.

8.3 Data Integration Architecture

---

9 Validation Statistics

9.1 Benchmark Dataset Summary

The synthetic benchmark dataset contains 2,000 investment projects designed to stress-test the scoring engine across extreme conditions.

9.2 Scoring Engine Validation

Three representative test cases demonstrate the engine produces economically coherent results:

Table 8: Validation Test Cases

Test Case	Country	Sector	Size	Danki Score	Band	SFDR	Veto
Renewable energy	France	Solar PV	EUR 5M	77.2	Dark Green	Article 9	No
Extractive industry	Nigeria	Oil & Gas	EUR 250k	28.7	Red	Article 6	No
Microfinance	Bangladesh	Financial Inclusion	EUR 8k	54.4	Amber	Article 8	No
Digital infra (forced veto)	Nigeria	Telecoms	EUR 1M	65.0	Amber (capped)	Article 8	**Yes — Gender**

---

10 Deployment

10.1 Technical Requirements

- **Python 3.10+** with pandas, numpy, matplotlib
- **Quarto 1.4+** for report rendering
- **No database required** — the app runs entirely client-side in the browser

10.2 Installation & Build

```
# 1. Clone the repository
git clone https://github.com/your-org/danki-impact-scoring.git
cd danki-impact-scoring

# 2. Install Python dependencies
pip install -r requirements.txt

# 3. Generate the benchmark dataset (first time only)
cd src
python generate_data.py
# -> data/processed/investment_impacts.csv (2,000 projects)

# 4. Render the whitepaper
cd ../report
quarto render index.qmd --to html --output-dir ../docs

# 5. Render the scoring app
quarto render app.qmd --to html --output-dir ../docs

# 6. Deploy to GitHub Pages
quarto publish gh-pages
```

10.3 Deployment Options

Table 9: Deployment Options

Option	Setup	Best For
GitHub Pages	`quarto publish gh-pages`	Public demo, LP access
Internal server	Copy `docs/` to any static file server	Analyst team, compliance
Offline	Open `docs/app.html` directly in browser	Field due diligence

The scoring app is **fully static** — no server, no database, no API calls. All scoring logic runs in JavaScript in the user's browser. This means:

- **Zero infrastructure cost**
- **Works offline** for field due diligence in low-connectivity environments
- **No data leaves the user's device** — important for pre-investment confidentiality
- **Instant deployment** — any static hosting works (GitHub Pages, Netlify, S3, internal server)

10.4 Project Structure

```
danki-impact-scoring/
|-- data/
|   +-- processed/
|       +-- investment_impacts.csv    <- 2,000-row benchmark dataset
|-- docs/                             <- GitHub Pages output
|   +-- assets/
|-- notebooks/
|   +-- eda_marimo.py                 <- exploratory analysis
|-- report/
|   |-- index.qmd                     <- this methodology whitepaper
|   |-- app.qmd                       <- Danki scoring app
|   +-- report-style.css              <- shared brand stylesheet
|-- src/
|   |-- generate_data.py              <- synthetic dataset generator
|   |-- scoring.py                    <- composite scoring engine
|   +-- viz.py                        <- chart functions
|-- requirements.txt
|-- _quarto.yml
+-- README.md
```

---

11 Limitations & Roadmap

11.1 Current Limitations (v1.0)

1. **Synthetic data only**: The benchmark dataset is generated, not sourced from real investments. Dimension scores are calibrated to be realistic but are not validated against actual outcomes.
2. **No temporal dimension**: Scores are point-in-time. Impact trajectories (improving vs. declining) are not captured.
3. **Equal treatment of PAI indicators**: All 18 mandatory PAI indicators are tracked but not differentially weighted within their parent dimensions.
4. **No automated data ingestion**: Users manually input project data. API connections to data providers are not yet implemented.

5. **ML layer is simulated**: The XGBoost calibration layer is designed but not yet trained on validated data.

11.2 Roadmap

Table 10: Development Roadmap

Phase	Deliverable	Timeline
Phase 1 (complete)	Scoring engine, whitepaper, interactive app, synthetic benchmark	Q1 2025
Phase 2	Real investment data onboarding, expert validation of dimension scores	Q2 2025
Phase 3	XGBoost calibration layer with SHAP explainability	Q3 2025
Phase 4	API connections to public data sources (TI CPI, World Bank, ND-GAIN)	Q3 2025
Phase 5	Proprietary data integration (MSCI, CDP, RepRisk)	Q4 2025
Phase 6	Portfolio-level scoring (aggregate multiple projects into fund-level impact)	Q1 2026
Phase 7	Temporal impact tracking and trajectory scoring	Q2 2026

---

12 References

1. **EU Taxonomy Regulation** (2020/852) — Official Journal of the European Union
2. **SFDR** (2019/2088) — Regulation on sustainability-related disclosures in the financial services sector
3. **CSRD** (2022/2464) — Corporate Sustainability Reporting Directive
4. **CSDDD** (2024/1760) — Corporate Sustainability Due Diligence Directive
5. **TCFD Recommendations** (2017) — Task Force on Climate-related Financial Disclosures, FSB
6. **MiFID II** (2014/65/EU) — Markets in Financial Instruments Directive, as amended for sustainability preferences
7. **ESMA/EBA** Joint Report on PAI (JC 2024/68, October 2024) — Principal Adverse Impact disclosures
8. **EU Omnibus Simplification Package** (December 2025) — CSRD scope narrowing to 1,000+ employees / EUR 450M turnover
9. **MSCI SFDR Adverse Impact Metrics Methodology** (2024) — PAI calculation standards
10. **Transparency International CPI** (2024) — Corruption Perceptions Index methodology
11. **UNDP Human Development Report** (2024) — HDI and Gender Inequality Index
12. **ND-GAIN Country Index** (2024) — Climate vulnerability and readiness
13. **GIIN** — Global Impact Investing Network, Annual Impact Investor Survey (2024)
14. **IMP** — Impact Management Project, Five Dimensions of Impact framework
15. **IFC Performance Standards** (2012) — Environmental and Social Sustainability
16. **OECD Guidelines for Multinational Enterprises** (2023 update) — Responsible business conduct

---