Meet

MALENA

IFC's Machine Learning ESG Analyst

AN INNOVATION OF IFC International Finance Corporation WORLD BANK GROUP

IN PARTNERSHIP WITH

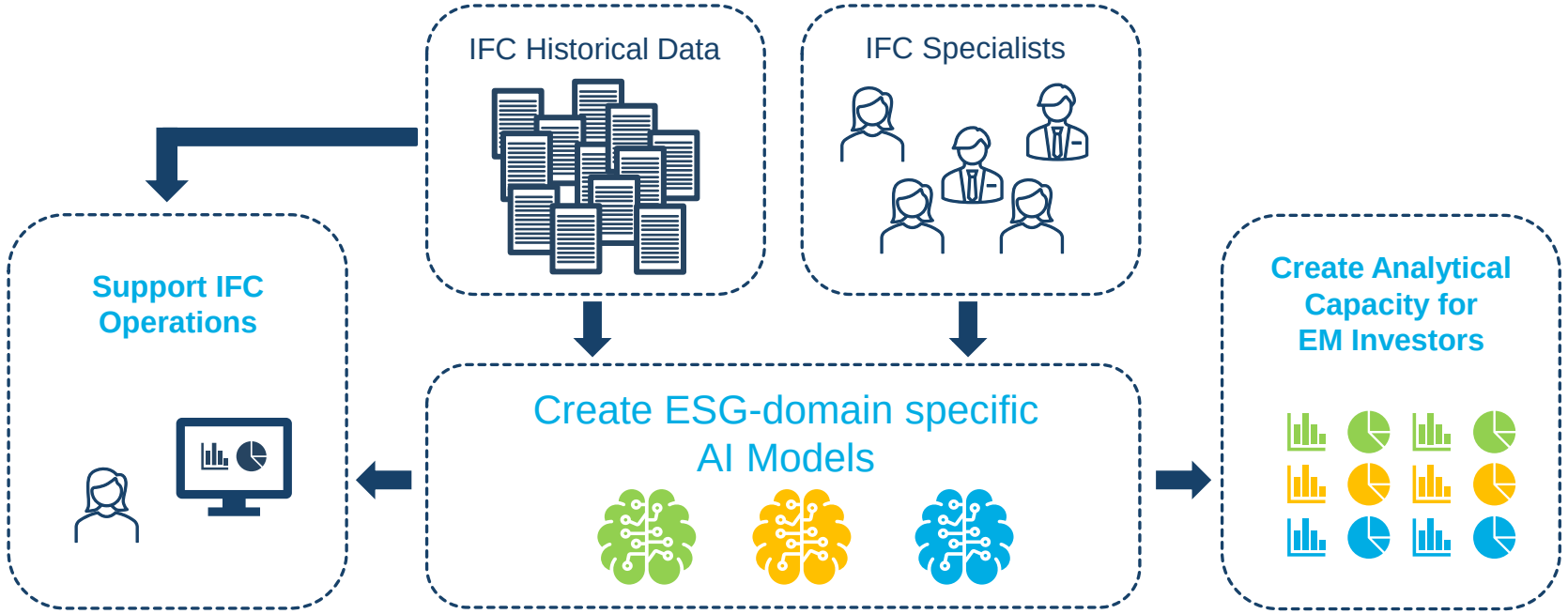
MINISTRY OF FOREIGN AFFAIRS OF DENMARK
Danida

Ministry of Economy and Finance

Leveraging Artificial Intelligence for Development

Goal: Develop innovative ESG solutions leveraging disruptive technologies to drive sustainable investment in emerging markets

- Use ***institutional knowledge*** and ***historical data*** to create ESG-domain artificial intelligence models
- Benefit Operations: ***Enhance*** ESG due diligence efficiency
- Create ***analytical capacity at scale*** for emerging market investors



MALENA

Driving Investments in Emerging Markets

Institutional Investors are instrumental in addressing the $2.5 trillion investment shortfall needed to address the UN SDGs

ESG Integrated Investing → **Efficient Resource Allocation** → **Development Outcomes** → SUSTAINABLE DEVELOPMENT GOALS

ESG Integration

- **lower risk**, **less** portfolio **volatility**, and **higher returns**

Strong Demand for EMs, but:

- **Lack** of uniform **reporting standards**
- **Poor** EM ESG **disclosures**
- Lack of **EM focused** ESG indicators
- **Diverging** ESG **rankings**

Market Gap

- Unstructured ESG data is **valuable** but **underused**

MALENA

Natural Language Processing to address ESG data and capacity needs

Recent developments in cloud computing and NLP techniques have led to innovations in the analysis of unstructured text data on a massive scale

Common NLP techniques

Named Entity Recognition	Identifies entities such as locations, companies, and organization names in unstructured text
Topic Modelling	Extracts key concepts from text to summarize and map information by topics
Sentiment Analysis	Classifies content by positive, negative, and neutral sentiment to detect risks and context

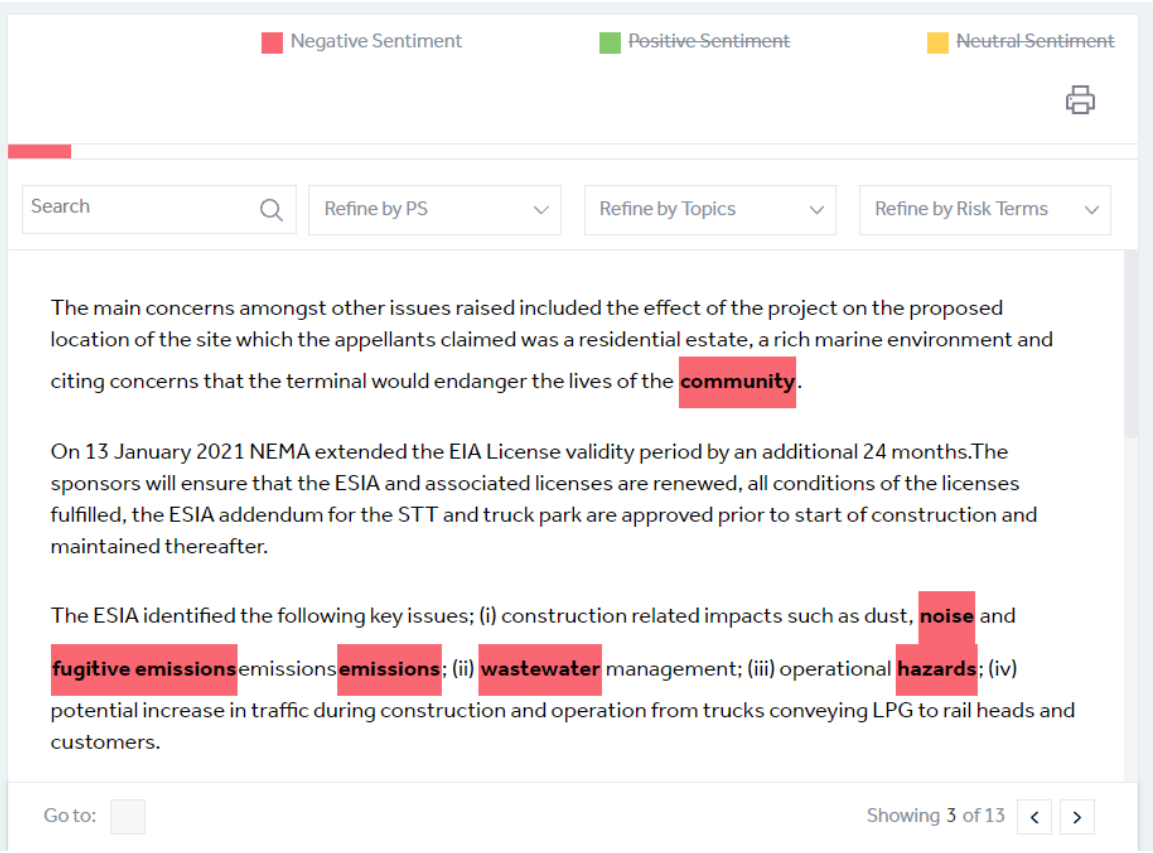
MALENA

What does MALENA do: NLP to unlock ESG text for emerging markets

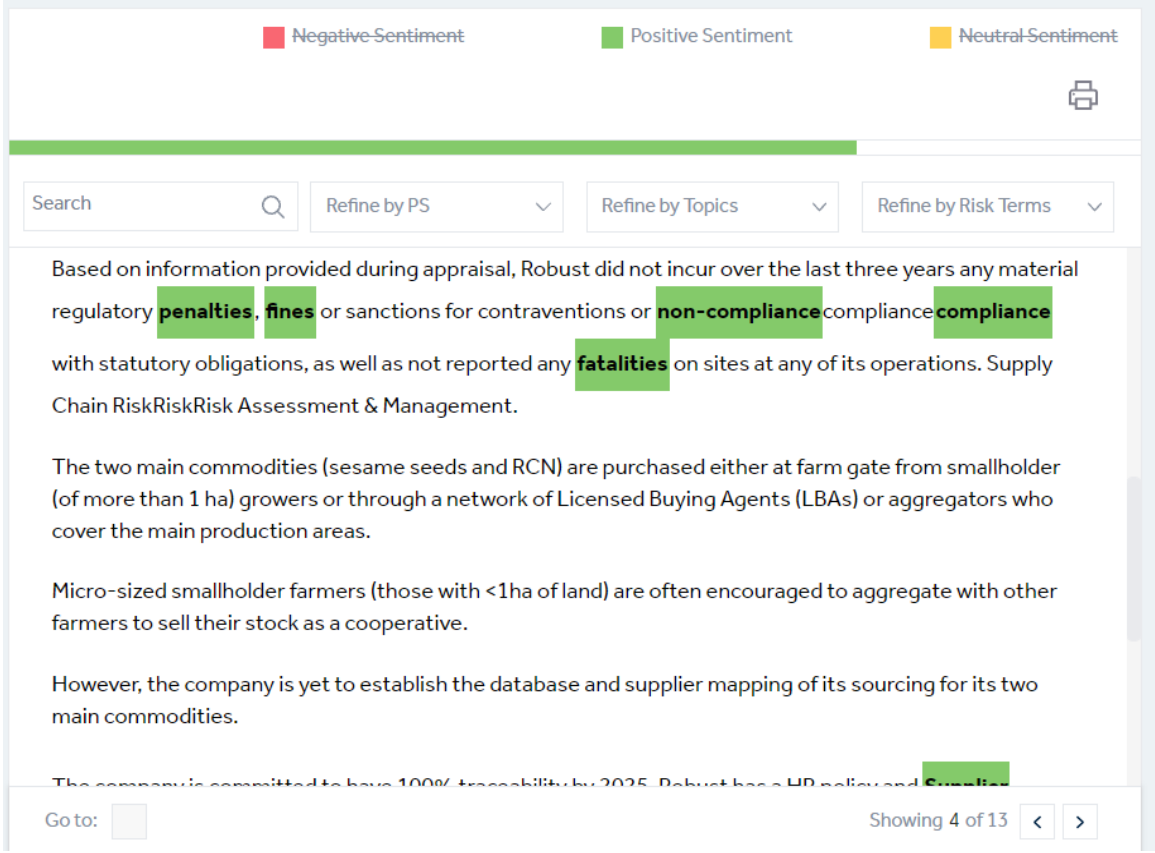
MALENA

MALENA can read documents to identify risks and find insights

MALENA will predict a negative sentiment for risk terms that occur in an ESG risk or performance gap context



There are no “negative” words. MALENA makes predictions based on context, for example: “no **fatalities**” = positive sentiment

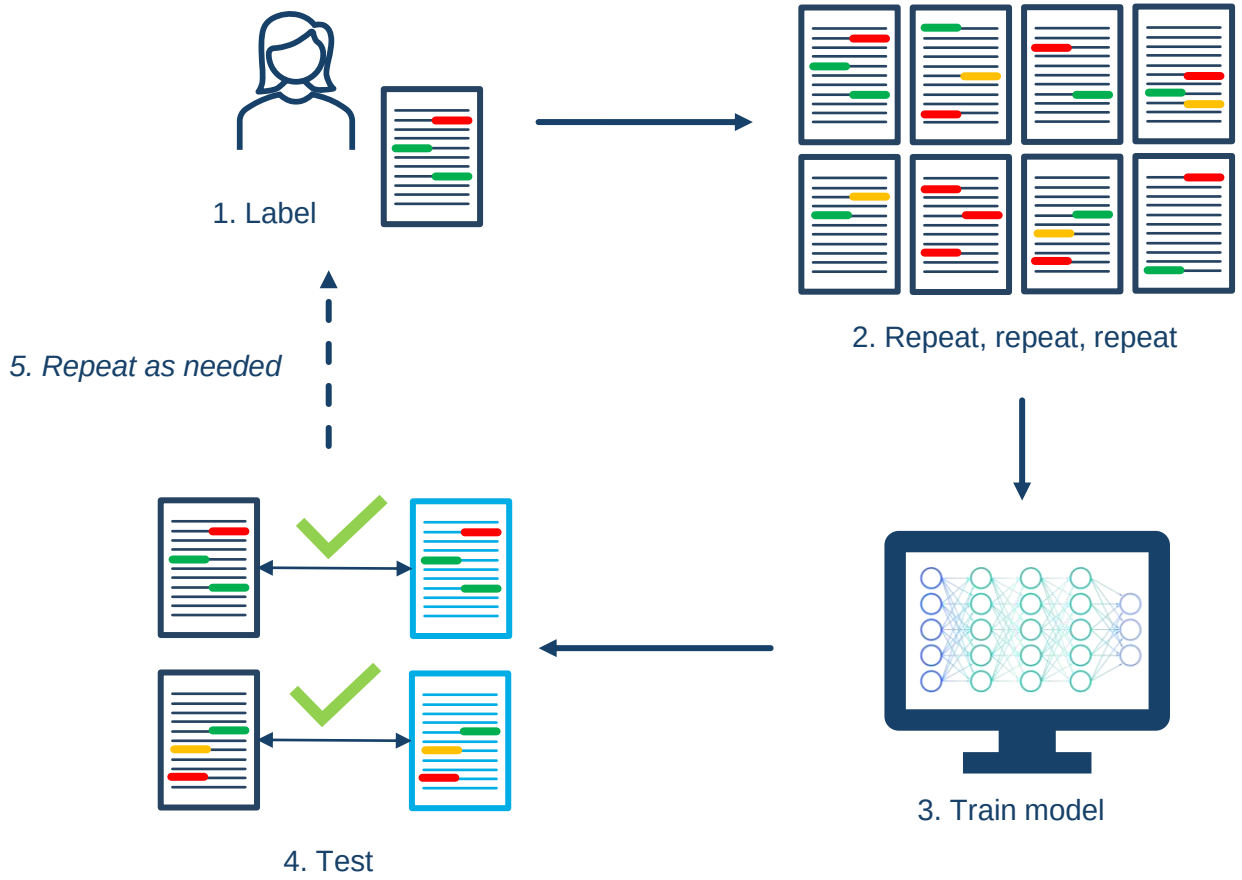


MALENA

How to Train a Model

How to train a … (supervised) model

- Clearly define the **purpose** and **goals** for the model
- **High quality** training data in **large quantities** is a key success factor for supervised machine learning models
- Follow **consistent** rules
- Establish **quality controls** for labeling



MALENA

Training MALENA and Model Performance

Training MALENA

MALENA is based on a pretrained, open-source model from Meta AI: **RoBERTa** (*Robustly optimized Bidirectional Encoder Representations from Transformers approach*)

- **Manually labeled training data** is used to teach MALENA through transfer learning
- **Quality controls** for labeling consistency
- **Active Learning** provides feedback for model refinement
- Data **quality checks** to address **bias** in training data
- Model performance: **90% Accuracy** / 87% F1 Score

MALENA

Training Data

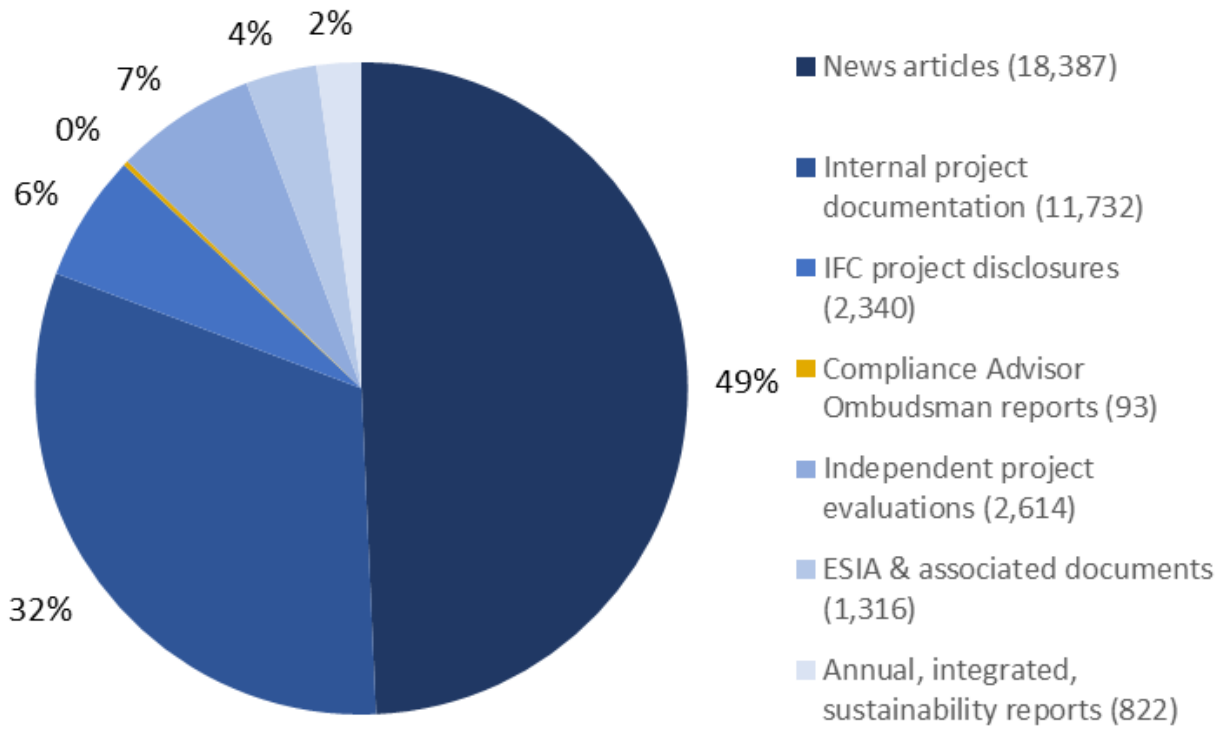
- **125,000+ labels** created by ESG analysts
- **1,200+ ESG risk terms** used for labeling
- Inventory includes E&S, CG, climate, and gender

MALENA Model Performance

Documents Analyzed

Documents analyzed & predictions made

To date, MALENA has been tested on more than 37,000 documents, resulting in over **14 million ESG signals**



MALENA

Ethical Artificial Intelligence

Importance of ethics in AI recognized by industry and governing bodies
UN, EU, OECD, NIST

IFC developed draft Technology Code of Conduct (TCoC) for the sustainable development of AI

MALENA assessed using draft TCoC

Data Bias	Available data for the model training & inference is not representative
Model Drift	Degradation of model performance due to changes in data and relationships between input and output variables
XAI	Solutions allowing humans to interpret why an AI model arrived at the results it produced

MALENA Data and Model Governance Framework

Q&A

MALENA

Case Study #1: Emerging Market Issuer ESG Scoring

Using NLP to unlock ESG data for emerging market Financial Institution issuers

Collaboration with AMUNDI Asset Management to compare MALENA results with AMUNDI's ESG scores

Sample:

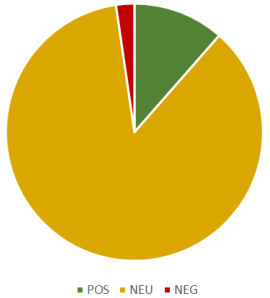
804
EM FI issuers of hard currency debt

441
Data identified for 441 FIs (55%)

- **402 Corporate reports**
- **415 Bond prospectuses**
- **428 ESG-related news reports**

1,260
Documents

1.6M
ESG Signals



Neutral	1.3M
Positive	189K
Negative	38K

Case Study #1: Results

441 Company ESG Profiles

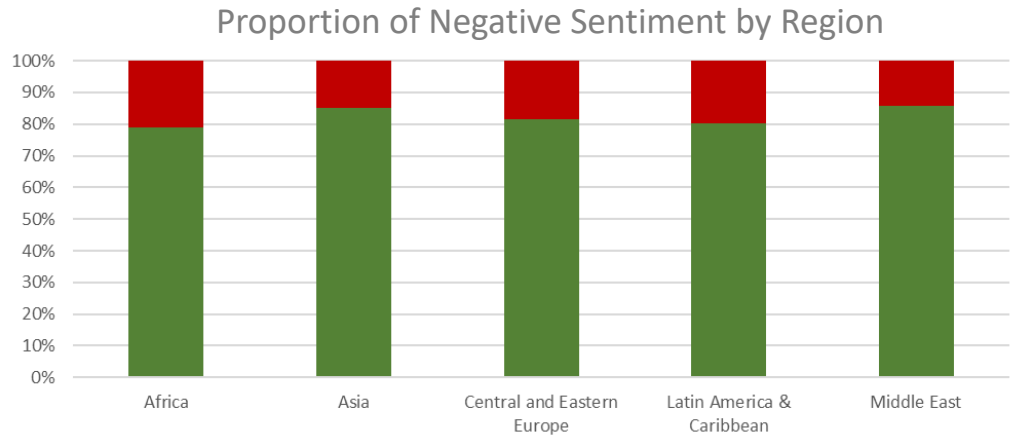
Correlation with asset manager ESG scores

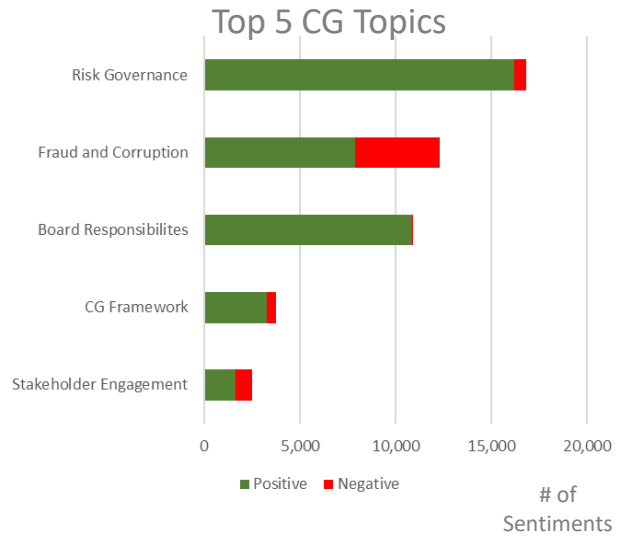
MALENA validated ESG scores for 205 FIs

Additional ESG profiles

MALENA provided an additional 236 ESG scores doubling asset manager coverage

EM FI Industry Profile





Case Study #2: ESIAs as ESG Performance Predictor*

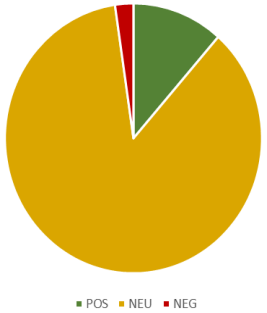
NLP to predict ESG performance of projects based on early-stage due diligence

Sample:

530 IFC projects

1,316
ESIAs & related Documents

1.4M
ESG Signals



Neutral	1.1M
Positive	210K
Negative	112K

Results:

Correlation between ESIA Sentiment Score and project E&S performance

ESIA documents the best predictor in sample

Predictions most accurate for riskier projects

MALENA

* These research findings are from a draft chapter. The final version will be available in *Handbook of Environmental Impact Assessment* edited by Alberto Fonseca, forthcoming 2022, Edward Elgar Publishing Ltd.

MALENA for Emerging Market Investors

MALENA Value Proposition

- **Enable ESG integrated investing** in EMs
- Analytical capacity to **rapidly screen ESG and impact data**, conduct **ESG risk assessment and management**
- **Time** and **cost savings**
- Scalable **Model as a Service** solution
- **Secure service** to analyze confidential documents
- **Beta testing** underway

Investor Use Case

Due Diligence

Analyze investees:

- Investment proposals
- Bond prospectus'
- Corporate reports
- Impact Assessments
- Regulatory Documents

Portfolio Management

Analyze performance

- Reporting and compliance documents
- Corporate reports
- Green Bond Impact Reports
- TCFD/Paris Alignment Disclosures

MALENA for Climate Finance

180+ climate risk terms covering **physical climate risk; factors impacting climate change; impact of climate change to communities and livelihoods**

MALENA

Looking ahead

- **Expanded MALENA taxonomy** - additional **SDG, climate, gender, and biodiversity impact** terms
- Continued improvements to model performance through **Active Learning**
- Data and Model Governance Framework to manage data **bias**, model **drift**, and **explainability** features
- Training MALENA NLP model to understand **additional languages**
- Publications in pipeline

HOW CAN YOU ACCESS MALENA?

- MALENA is currently in beta testing
- Investors can securely access the MALENA sentiment analysis model via API
- Receive sentiment predictions for ESG risk terms
- Contact us if you are an investor in emerging markets interested in beta testing MALENA

MALENA

Q&A

Thank you!

Atiyah Curmally

linkedin.com/in/atiyah-curmally/

Florian Skene

linkedin.com/in/florian-skene/

For more information, visit: https://www.ifc.org/sustainability/malena

MALENA