

WHAT SEKU CAN BRING TO CLAIMATE

AI Climate-Risk Modelling, Explainable AI and Cross-Climatic Validation

HORIZON-MISS-2027-01-CLIMA-02

Researching and applying the potential of Artificial Intelligence to foster climate resilience at regional and local levels

Institution: South Eastern Kenya University (SEKU), Kenya

Proposed Role: Funded Scientific Beneficiary

Scientific Positioning: AI climate-risk modelling • probabilistic prediction • uncertainty quantification • explainable AI • digital twins • cross-climatic validation.

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1. Why SEKU for CLAIMATE?

SEKU can complement CLAIMATE's conversational-AI and stakeholder-engagement architecture with a rigorous **climate-intelligence modelling layer**. SEKU combines expertise in statistics, artificial intelligence, mathematical and computational modelling, hydrology, hydroclimatology, environmental science and climate adaptation.

Its distinctive contribution is the transformation of heterogeneous **climate, Earth-observation, hydrological and exposure data** into probabilistic, explainable and uncertainty-aware climate-risk information suitable for communication through CLAIMATE to regional and local decision makers.

SEKU also brings existing **Horizon Europe digital-twin experience in flood readiness**, providing a foundation for linking predictive climate AI with digital twins, early warning and local climate-resilience decision support.

2. Scientific Work SEKU Can Own

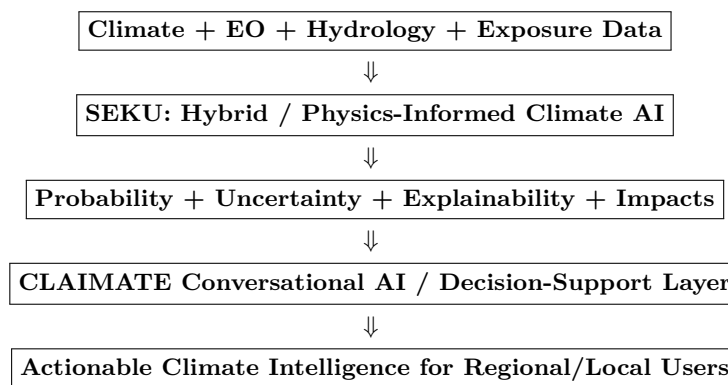
T1 – AI-Enabled Climate-Risk Modelling. Develop hybrid statistical-AI, machine-learning/deep-learning and physics-informed models for extreme rainfall, flooding, drought, heat and compound climate hazards.

T2 – Probabilistic Prediction and Uncertainty Quantification. Develop Bayesian, stochastic, ensemble and extreme-value methods for event probability, severity, predictive intervals, uncertainty propagation and confidence calibration.

T3 – Explainable and Trustworthy Climate AI. Integrate SHAP/XAI, model interpretation, bias assessment, reliability diagnostics and uncertainty communication so CLAIMATE can explain *what* is predicted, *why*, and *with what confidence*.

T4 – Cross-Climatic Validation and AI Transferability. Evaluate distribution shift, domain adaptation, transfer learning, regional recalibration and physics-informed constraints when AI models are transferred between contrasting climatic regimes.

3. Proposed Integration with CLAIMATE



4. Flagship Scientific Contribution

Africa–Europe Climate-AI Transferability Experiment

SEKU proposes systematic stress-testing of AI models across contrasting climatic regimes. For a model M_E developed or calibrated under European conditions, define the transferability gap

$$\Delta_{\text{transfer}} = L_A(M_E) - L_E(M_E),$$

where L_E and L_A denote predictive loss under European and African climatic conditions, respectively. SEKU will investigate whether **transfer learning, domain adaptation, regional recalibration and physics-informed constraints** can minimise

$$\Delta_{\text{transfer}}.$$

This provides CLAIMATE with evidence on whether its underlying climate-AI models remain reliable under climatic distribution shift.

5. Cross-Climatic Validation Environments

Environment	Scientific Application
Kitui / South-Eastern Kenya	Semi-arid drought, heat, extreme rainfall, water scarcity and climate–agriculture interactions.
Upper Tana–Embu	Extreme rainfall, drought, streamflow, catchment response and water-resource risks.
Nairobi–Upper Athi	Extreme urban rainfall, flooding, infrastructure exposure and impact-based early warning.

These environments are proposed for additional scientific stress-testing and cross-climatic validation and would complement, rather than replace, CLAIMATE’s European regional/local demonstrations.

6. Proposed SEKU Deliverables

D1	Hybrid AI Climate-Risk Modelling Framework	D2	Probabilistic Prediction and Uncertainty Toolkit
D3	Explainable and Trustworthy Climate-AI Module	D4	Europe–Africa Climate-AI Transferability Benchmark
D5	Cross-Climatic Validation and Model Adaptation Protocol		

SEKU VALUE PROPOSITION

AI + Statistics • Physics-Informed Modelling • Probabilistic Climate Risk • Explainable AI • Digital Twins • Hydroclimatic Extremes • Cross-Climatic Validation

SEKU seeks to participate as a funded scientific beneficiary with clearly defined technical tasks and deliverables, providing CLAIMATE with modelling, uncertainty, explainability and cross-climatic validation capabilities needed to translate AI outputs into scientifically defensible and actionable climate intelligence.