

The Importance of Uncertainty & Quality Indices for Working with Digital Twins in Earth Sciences – The DestinE Initiative

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<https://digital-strategy.ec.europa.eu/en/policies/destination-earth>

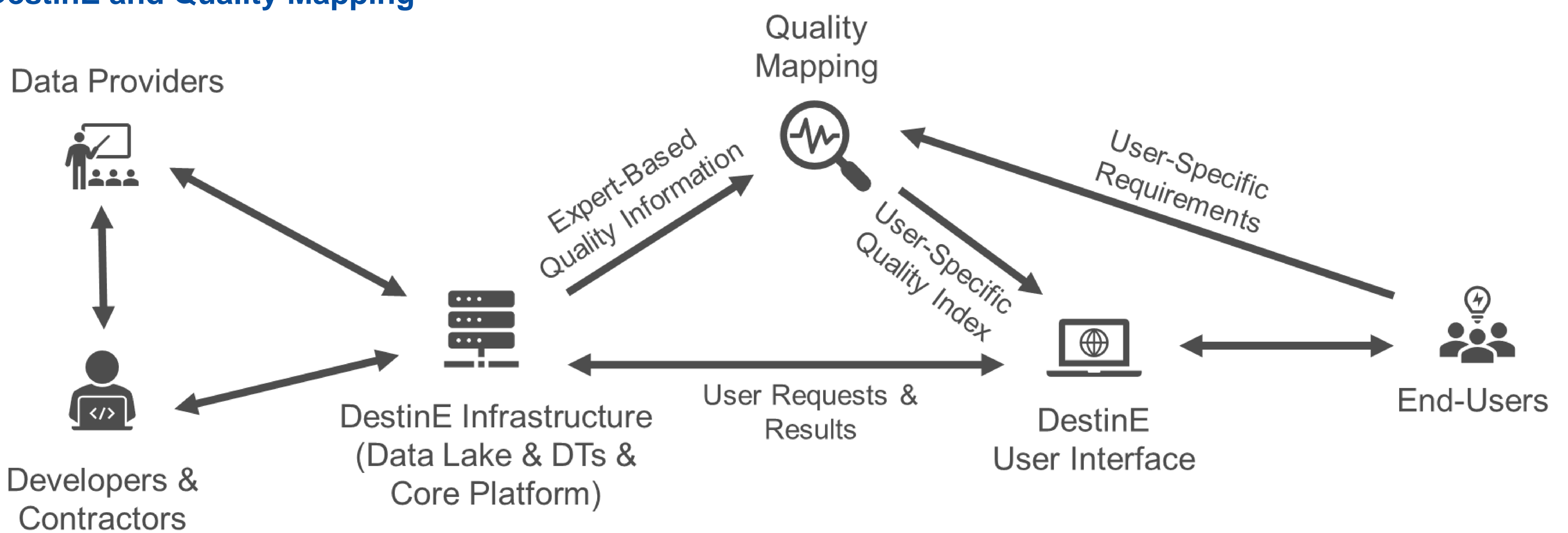
The DestinE Initiative

- EU's next gen modelling platform for high precision models of Earth using Digital Twins
- Integrates space and ground based observations with models and HPC resources in a single ecosystem
- Key part of the EC's Green Deal and Digital Strategy
- Aimed at policy and decision support
- First applications focusing on climate change adaptation/mitigation and disaster risk management

Quality and Uncertainty with Quality Mapping (QM)

- When are results “good enough” to be actionable for policy decisions?
 - How can expert-based uncertainty be conveyed to non-experts?
 - How to foster trust in scientific results – especially for climate change adaptation / disaster risk management?
- Provide comprehensive (single) quality index to assess validity/actionability of results
- Automated quality mapping system to generate and propagate such quality metrics for each DestinE product

DestinE and Quality Mapping



Advantages for End-Users

- Consistent and unified framework to transparently quantify and communicate uncertainty
 - Providing decision support for non-scientist based on actionability index makes scientific results more accessible for policy use
 - Inclusion of and integration with quality metrics for socio-economic models as driver behind policy decisions
 - Objective indicator for research areas in need of improvements or additional funding
- Initial reference projects will be based on feedback from policy end-users

Feasibility Evaluation

- Need for a QM system aimed at science-for-policy identified based on broad end-user and community feedback
- A basic QM systems will translate between expert-based uncertainty and unambiguous actionability metrics by curating and propagating quality information across models and mapping these metrics to well-defined actionability indices with full traceability
- Most technical means to support QM framework are already available or can be scaled-up
- QM will build on existing concepts and technologies (e. g. Copernicus, IPCC, FAIR, NUSAP)
- No known system is capable of performing all the tasks required for QM on the scale envisioned by DestinE

Outlook

- Necessary knowledge shall be built-up in a co-design process leveraging direct end-user feedback and lessons learned from other projects and specific case studies
- Follow-up studies (e.g. validation of QM concept using case studies; evaluation for policy purposes based to real-world disasters and response efforts)
 - Implementation of initial reference projects
 - Possible take-up and full implementation of the QM framework in DestinE in its 2nd phase >2024
- **Continuous feedback from science community as well as policy end-users is encouraged !**