

















- UNICEF NY Innovation Office
- UNICEF NYHQ Health Section Programme Division
- UNICEF Latin America and the Caribbean Office (LACRO) Survive & Thrive
- UNICEF LACRO Climate, Environment, and Disaster Resilience
- UNICEF Emergency Officer Peru Country Office









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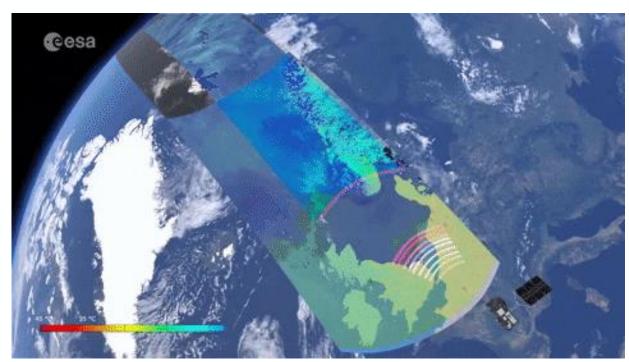


European Space Agency

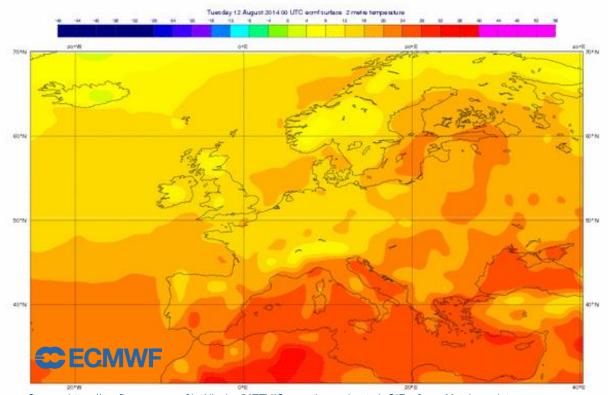


Environmental products collected from several Earth Observation sources





Source: https://www.esa.int/ESA_Multimedia/Videos/2016/07/Sentinel-3_s_scanning_radiometer



Source: https://confluence.ecmwf.int/display/METV/Generating+animated+GIFs+from+Metview+plots

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European Space Agency



Dengue incidence rate (DIR) by month from 2010 to 2019 across 25 Peruvian departments

La Libertad

2016 2014 -2012 -

2016 2014 -

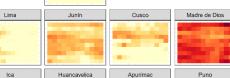
2016

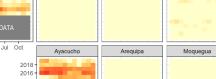


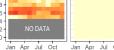


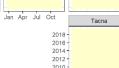












The figure on the right demonstrates that Peru has three dengue scenarios:

- Dengue-endemic incidence.

Objective

As a climate-sensitive disease, the risk of dengue transmission is increased by warming climates. Therefore, this ESA-UNICEF project aims to develop an Al algorithm to forecast dengue outbreak accounting for the effect of Climate Change.

Methodology

This project explores an ensemble model of multiple machine learning approaches, combining the outputs from Long Short-Term Memory (LSTM) and Categorical Boosting (CatBoost) regression methods.

Outcome

The forecast model will be used by UNICEF to help governments on the strategy and measures to prevent the worsening and global spread of dengue incidents.

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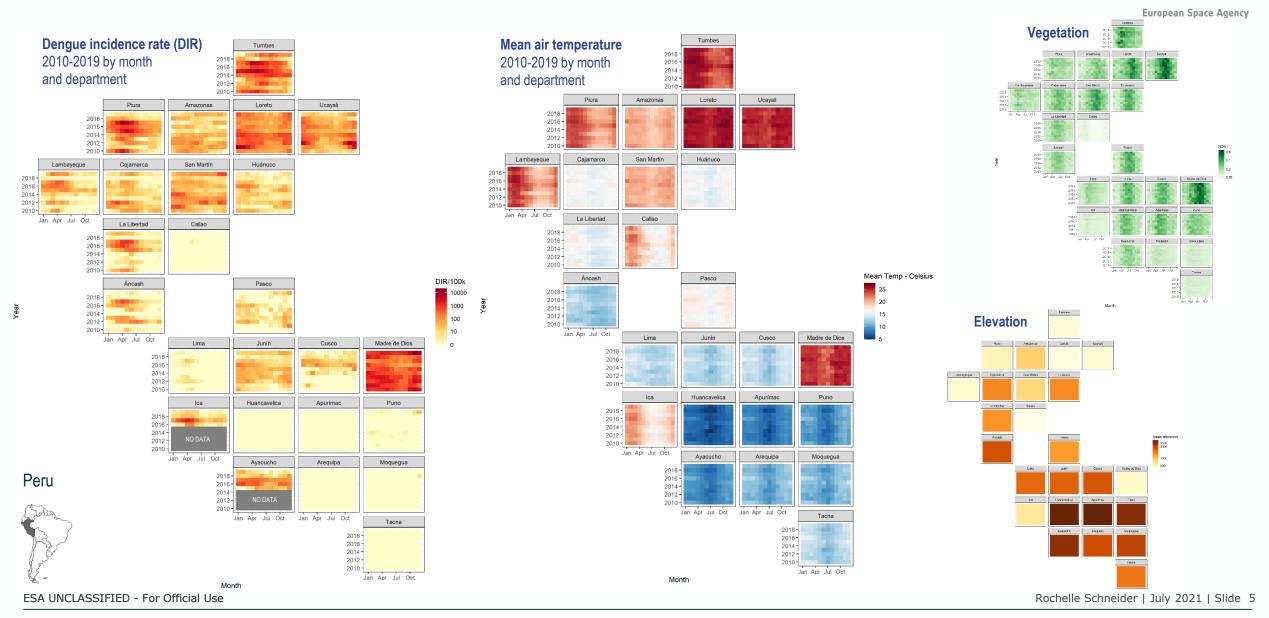




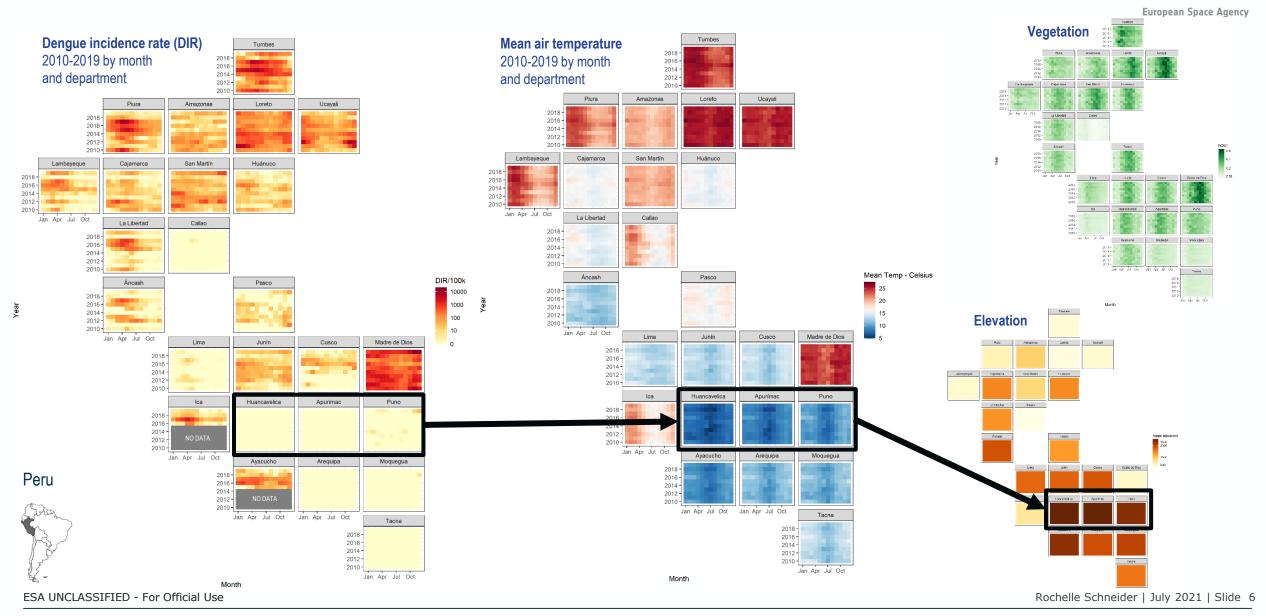
Dengue incidence rate by month from 2010 to 2019 across 25 department

- Dengue-free incidence;
- Dengue-seasonal incidence;

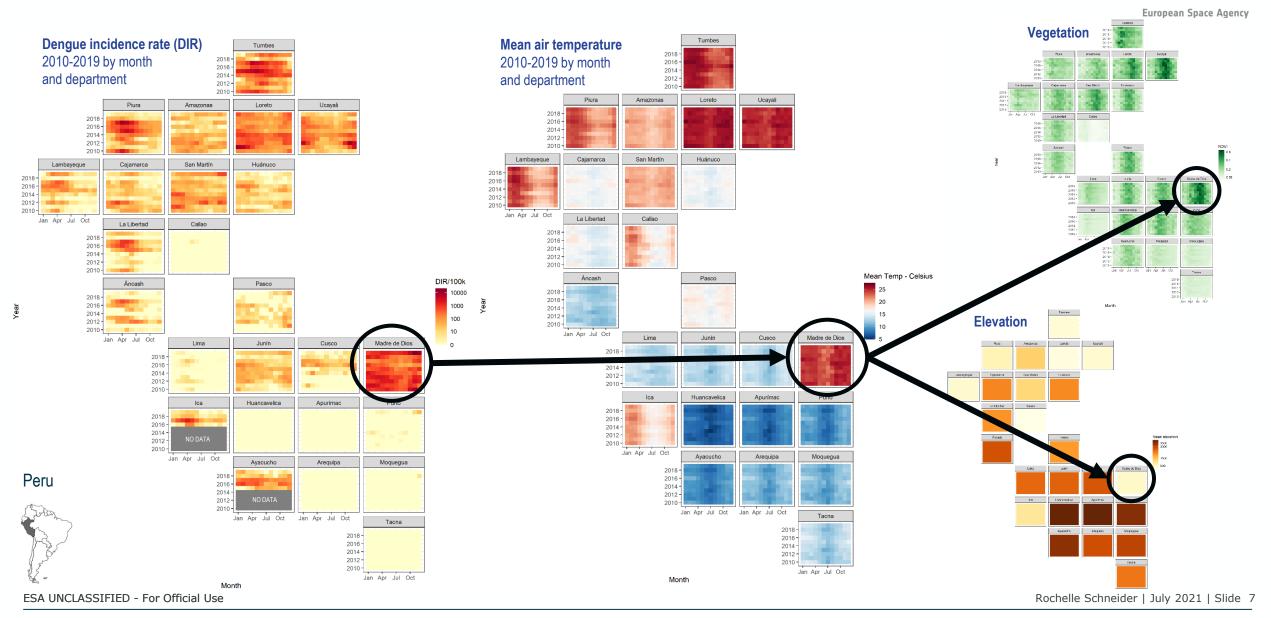




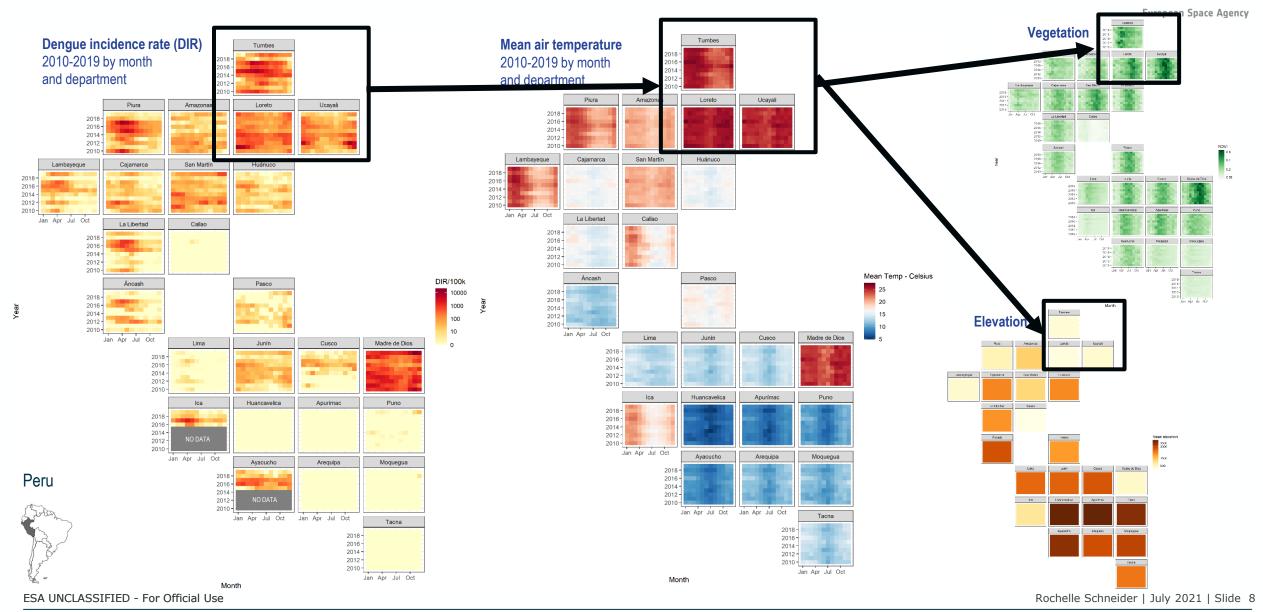














Dengue incidence rate (DIR) by month from 2010 to 2019 across departments **European Space Agency** DIR/100k Al4EO4Health CatBoost 10000 Lima Junín Cusco Madre de Dios 1000 2018 100 2014 10 2012 **Fully Connected LSTM** Jan Apr Jul Oct Jan Apr Jul Oct Jan Apr Jul Oct Jan Apr Jul Oct Mean Temp 25 Madre de Dios Lima Junin Cusco Dataset Prediction tx+8 20 2018 Deparments 2010-2019 2016 Amazonas 15 Climatic monthly Ancash 2014 distributed data 2012 10 Ucayaii 7x53 Deparments 2010 2010-2019 Amazonas Average - Prediction tx+8 16 nodes+ LSTM+tanh Dropout+ monthly Geophysical Ancash Humidity Dropout+ ReLU distributed data Dropout (0.2) Ucayali Lima Junín Cusco Madre de Dios ReLU Deparments 2010-2019 Amazonas CatBoost Dengue monthly Ancash 2016 cases distributed data 50 Ucayali Prediction tx+8 Time Series: from tx to tx+ 25 **NDVI** Lima Junín Cusco Madre de Dios 0.4 2016 - LSTM prediction 0.2 2014 -2012 0.05 Mean elevation 3500 Lima Cusco Madre de Dios Junín 3000

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1500 500





















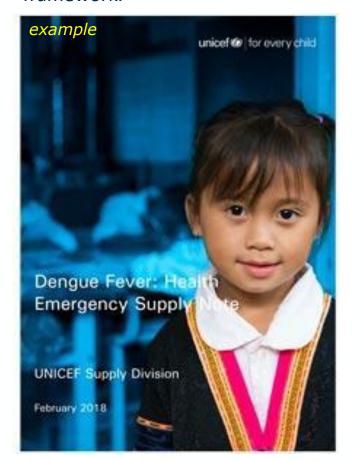
Next Steps - UNICEF AI4EO4Dengue cookbook



1. Scalability and sustainability of AI solution



2. Provide an open/free 'do-it-yourself' guided book: a fully-reproducible framework.



3. Share: data, AI solution framework, and Python/R scripts



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Thank you!

"We need to develop the resilience and determination to tackle the climate challenges faced by children of today and tomorrow. Working with the European Space Agency that has expertise in earth observation and complex model development, it was possible to contribute to these objectives, through an understanding and an innovation on climate resilience! Like almost every other kind of innovation, it requires the ability to collaborate and share ideas with others, get feedback and understand the needs. ESA is standing for all these principles, which we, UNICEF, believe enable the conditions for cocreating safer and healthier environment for children".



Hanoch Barlevi
UNICEF Regional Climate, Environment and Disaster Resilience for every child

