ESA CONTRACT NO. 4000131356/20/NL/AF WITH TERRARIA SRL

SPACE IN RESPONSE TO COVID-19 OUTBREAK

EPICO19

EPIDEMIOLOGICAL AND LOGISTIC COVID-19 MODEL

www.epico19.eu

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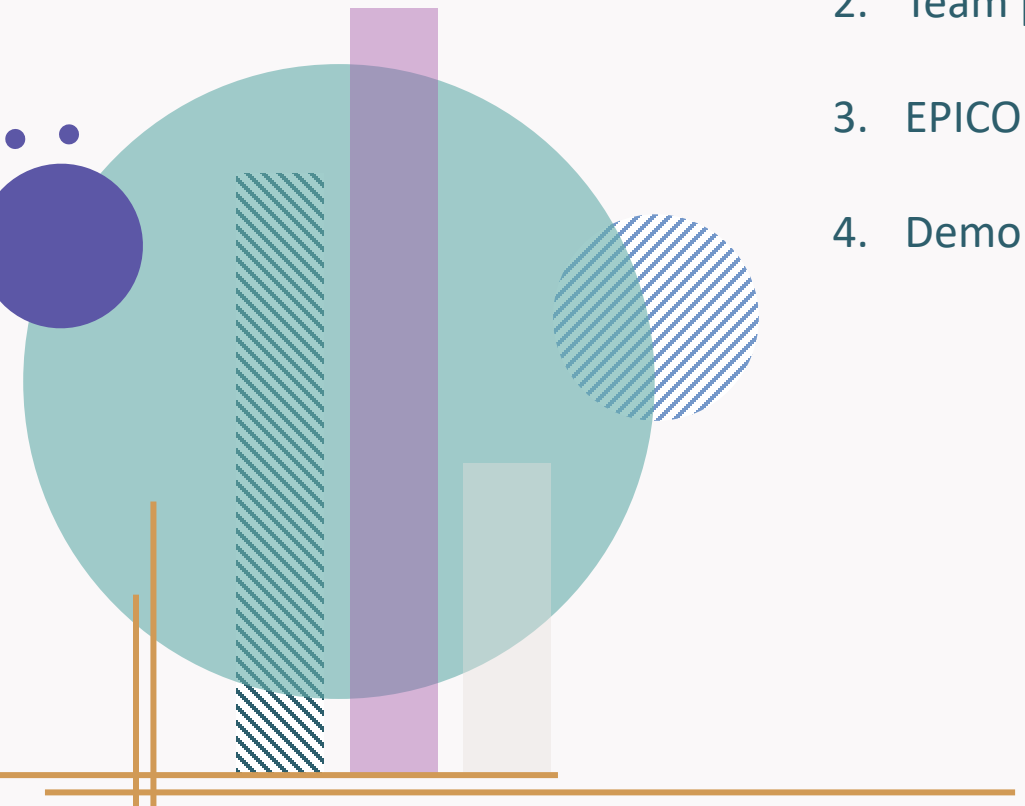
OUTLINE

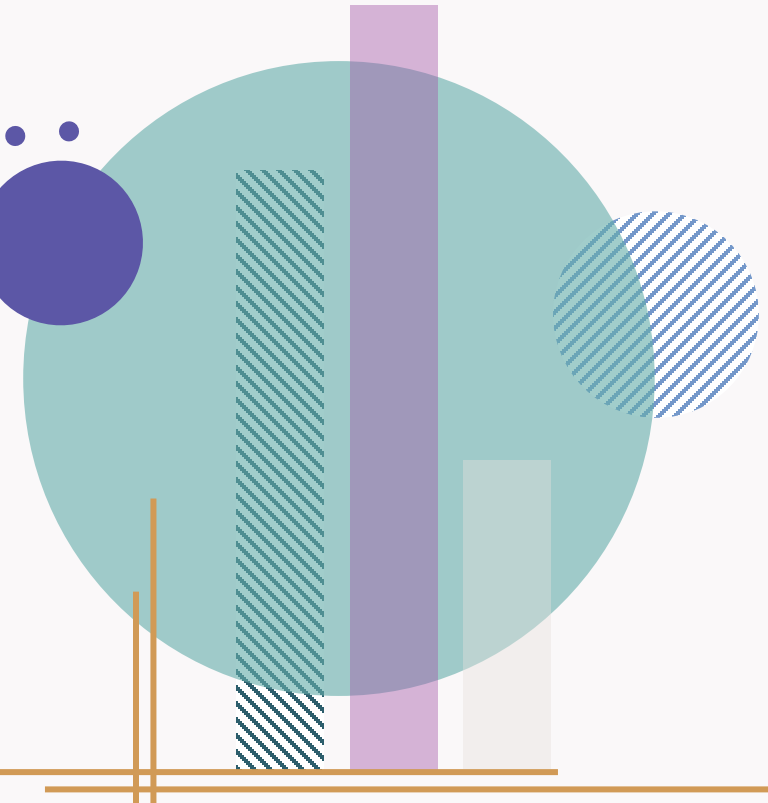
1. EPICO19's introduction
2. Team presentation
3. EPICO19's engines
4. Demo of the developed solution



EPICO19

EPICO19 (Epidemiological and logistic COVID-19 model) platform aims to:

- **support** local health agency technicians and decision makers in the management of pandemic events with a **DSS** (Decision Support System)
- **simplify** access, display and comprehensibility of pandemic data in a simple and intuitive interface
- **make predictions** at the local level on the trend of key indicators with a methodology validated in Reggio Emilia province
- **share through an automated report** part of the information, graphs and maps on the pandemic trend externally



EPICO19'S TEAM

EPICO19 was developed by the **innovative SME TerrAria srl**, specialized in the creation of ICT platforms and solutions for public and private entities, with the collaboration and technical-scientific support of:

- **Studiomapp srl**, deeptech **startup** specialised in AI and geospatial intelligence
- **UNIMORE - CREAGEN**, Research Center in Environmental, Genetic and Nutritional Epidemiology of the University of Modena and Reggio Emilia

Reggio Emilia Local Health Authority (AUSL), provincial institution which deals with the management of health policies and epidemics at the level, is EPICO19 **end user**

TerrAria s.r.l.
https://www.terraria.com/

STUDIOMAPP
https://www.studiomapp.com/

UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA
www.creagen.unimore.it

END USER

EPICO19 has been tested by AUSL Reggio Emilia during the pilot phase of the project, from April 2021 to December 2021.

“(…) EPICO19 responds to the needs of those involved in pandemic management”

“(…) EPICO19 provides accurate forecast of short term hospitalizations”

EPICO19

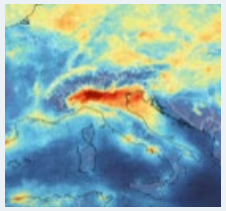
BACK END

TerrAria s.r.l.

INPUT DATA

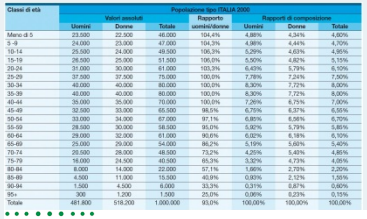
SATELLITE IMAGES (NO_2/MOBILITY)	HEALTH DATA (COVID19 CASES…)

SATEO



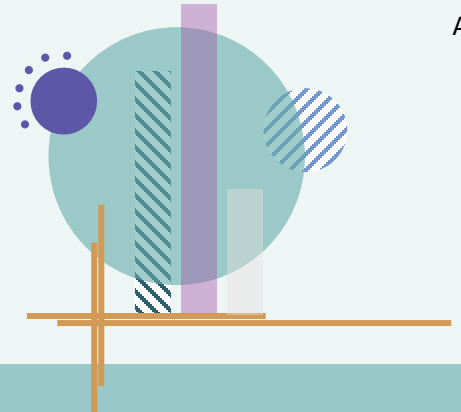
VHR

STUDIOMAPP
maps and apps for quality of life



SERVIZIO SANITARIO REGIONALE
EMILIA-ROMAGNA
Azienda Unità Sanitaria Locale di Reggio Emilia
IRCCS Istituto in tecnologie avanzate e modelli assistenziali in oncologia

EPICO19 ENGINES



AI EPIDEMIOLOGICAL MODEL

UNIVERSITAS STUDIORUM MUTINENSIS ET REGIENSIS 1175
UNIMORE
UNIVERSITÀ DEGLI STUDI DI MODENA E REGGIO EMILIA

WHAT-IF HEALTH POLICIES SCENARIOS

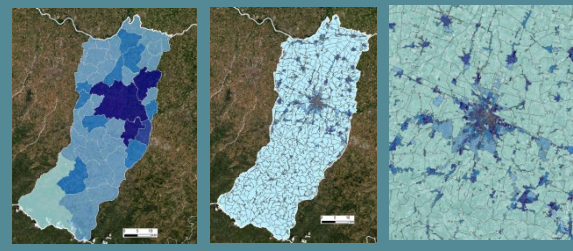
esa

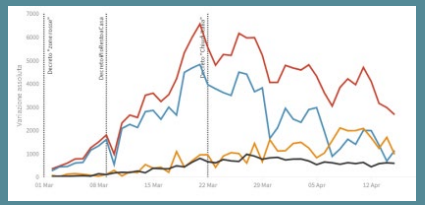
FRONT END

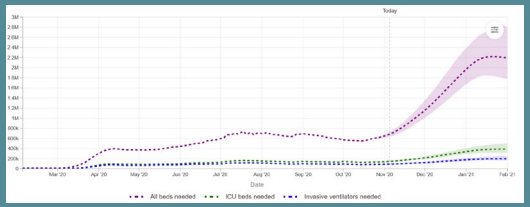
PUBLIC HEALTH EXPERTS

MONITORING
PAST, CURRENT AND FORECASTED
OUTBREAK DIFFUSION MAPS

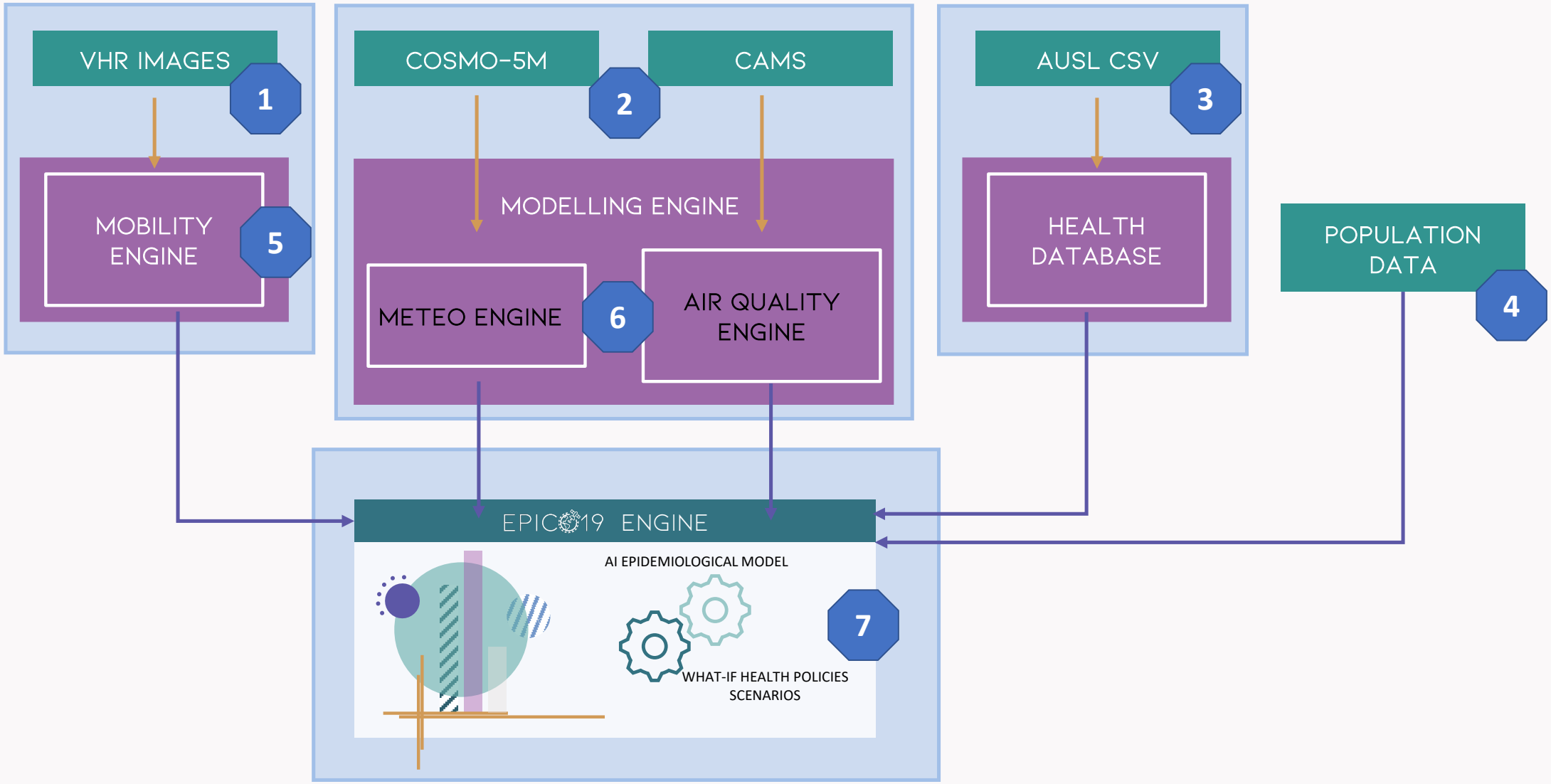
WHAT-IF HEALTH POLICIES SCENARIOS
(PAST, CURRENT AND FORECASTED)







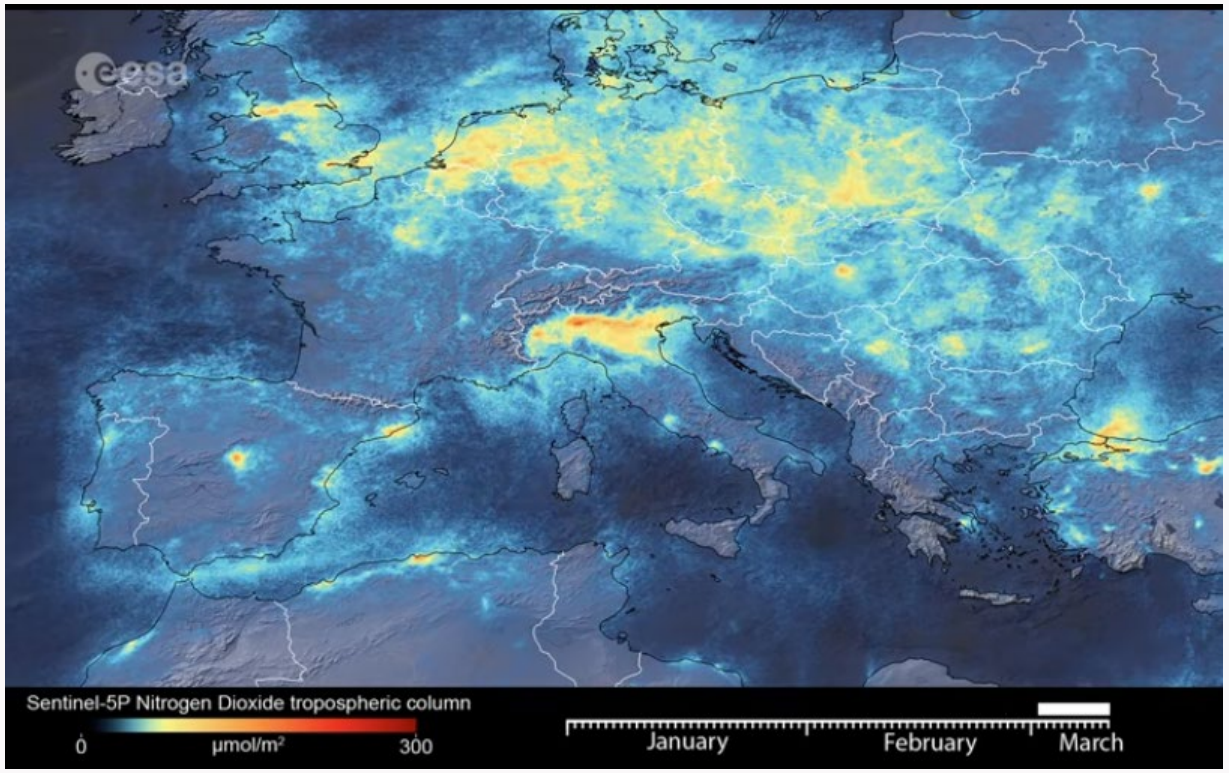
ENGINE COMPONENTS OF EPICO19

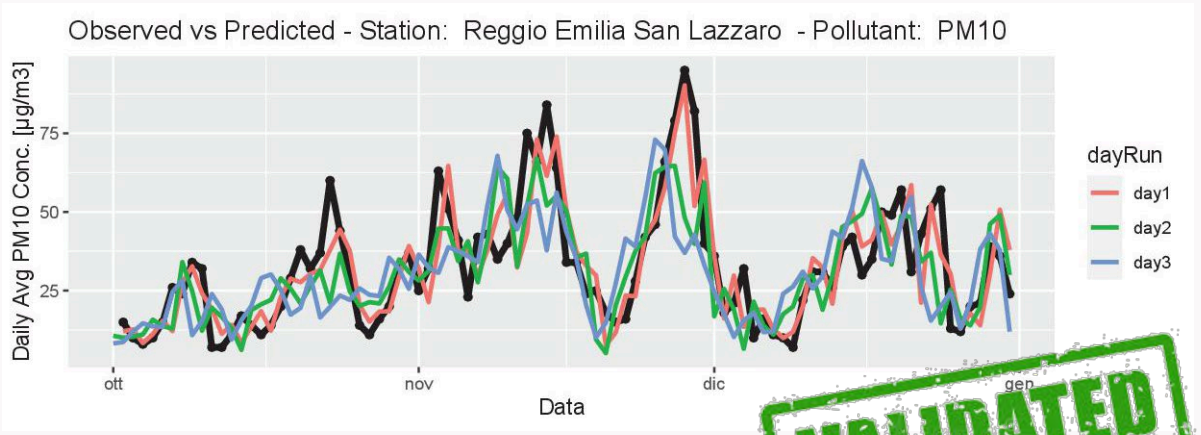


EPIC 19

AIR QUALITY ENGINE

- It consists of two sub-processes: meteorological and air quality model.
- Meteorological model is **COSMO-5M**.
- Air quality model uses **CAMS model - analysis service**, downscaled at local scale with the integration of air quality measurements and local traffic emission thanks to the methodology of **Urban Tool for Air Quality** (UTAQ**)** developed by TerrAria.





VALIDATED

www.utaq.eu

EPIC 19

MOBILITY ENGINE

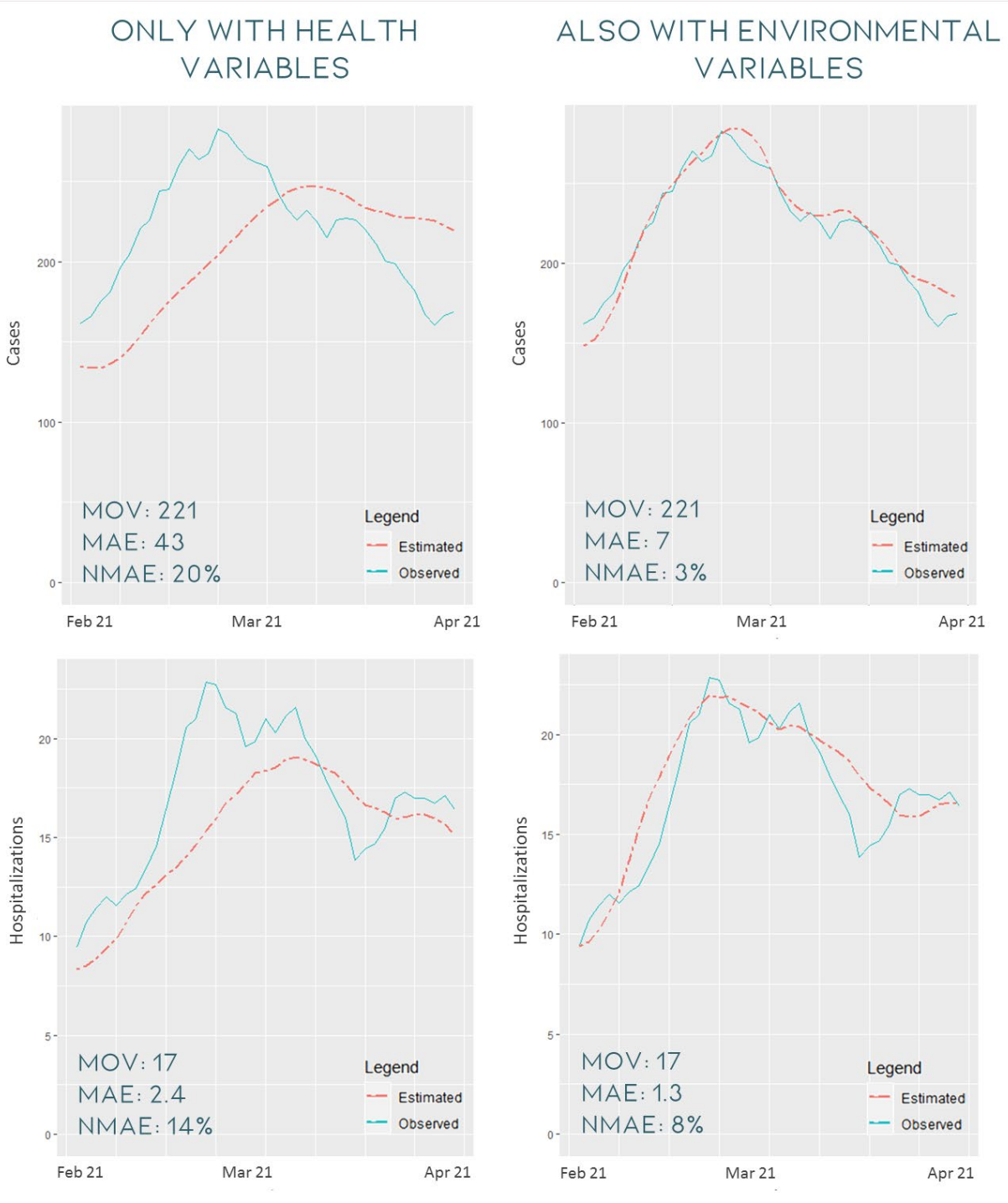
- Studiomapp delivered a daily crowding index as a **mobility indicator** using a **multisource and multisensor approach**, combining traffic open data, Copernicus services and VHR satellite/aerial imagery.

- VHR satellite and aerial imagery were analysed using Studiomapp's proprietary algorithm that automatically detected and localised up to 22 different types of vehicles. This enabled us to count the number of cars, buses and trucks and estimate the presence of people in hospitals, parking lots, supermarkets, working places, train stations and logistic hubs.

EPICO19

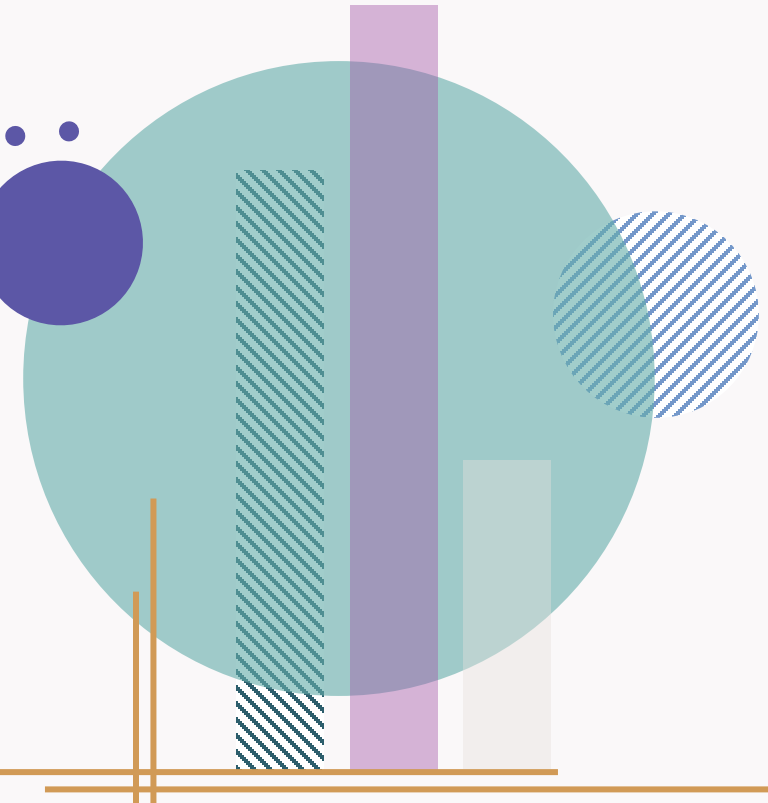
EPIDEMIOLOGICAL ENGINE

- It exploits **Machine Learning models** as Convolutional Long Short-Term Memory (ConvLSTM), which can deal spatial and temporal components, to **predict cases and hospitalizations related to COVID-19**.
- It is possible to carry out simulations for a maximum of **7 days of forecast both** in the future and in the past.
- Cases model is fed with auto-regressive component, crowding index, average daily solar radiation, PM2.5 average concentrations. Hospitalization model is fed with cases, crowding index, average daily wind speed.



EPICO19: ADDED VALUES

- Added values compared to the other solutions:
  - **AI self-learning predictions**
  - **Local scale analysis** (census section)
  - **Automated report** with graphs, maps and reports
  - Communication with citizens (optional)
- The features developed fully respond to the **needs** of the first user (AUSL Reggio Emilia) and are **easily adaptable** to other realities in the Italian territory
- Science based: the different models used are at the end of the scientific **validation process**, thanks to the experiences and contributions of internationally recognized organizations



DISSEMINATION

Oral presentation at the SISMEC National Congress https://sismecbari2021.it/, Bari, Italy) on 16 September 2021

Oral presentation at SItI National Congress http://www.sitinazionale.org/ in Lecce (Italy) on 6 November 2021

Conference focused on “The epidemiology of COVID-19, satellite data and Artificial Intelligence for the fight against pandemics” on 2 December 2021 in Reggio Emilia (Italy) https://www.creagen.unimore.it/lepidemiologia-del-covid-19-i-dati-satellitari-e-lintelligenza-artificiale-per-la-lotta-alle-pandemie/

Abstract published on the "Book of Abstract" of World Space Forum 2021 https://www.unoosa.org/oosa/en/ourwork/world-space-forum/2021/world-space-forum-2021.html

TOOL DEMO

http://epico19.terraria.com/html/public/login.jsf

THANKS FOR YOUR ATTENTION

www.epico19.eu

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