POLITECNICO DI TORINO

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From weather forecasting to predictions of risks to human life

How do technologies and the interconnected world change the prospects of what can be predicted, and possibly be avoided?

In the picture, Thierry Breton, EU Commissioner for internal market and services, presents the ambitions of the digital decade and, to the right, an example of realistic digital reconstruction of the Earth view from the Moon in 1969, made with ECMWF's climate reanalyses. How will Earth look like in 2050?

5 March 2021 | It is said that there is no Planet-B and it is true that space explorations for now are limited to rather monocromathic and unbreathable dusty planets, such as Mars (suitable for robots exploration, such as Perserverance Rover, entailing some Italian technology and pride).

But looking at it from a different perspective, perhaps we a "planet B" in the **digital version of Planet Earth** that the **European Center for Medium-range Weather Forecast (ECMWF)** with the **European Space Agency** (ESA) and the **European Organization for the Exploitation of Meteorological Satellites** (EUMETSAT), are building for the European Commission under the initiative called **Destination Earth**.

An example of the current potential is given by the digital reconstruction of the **Photography "Earthrise"** taken from the Moon and that has inspired several generations from 1969 to the present.

Well, today that photo can be digitally recreated using ECMWF's Climate Reanalyses.

The same capacity will be pushed in a predictive way and according to different evolution scenarios.

This is well explained by **Gianpaolo Balsamo***, Team Leader and Principal Scientist at the ECMWF and from 2020 invited lecturer at the 2° level Specializing master's programme «**Climate Change: adaptation and mitigation solutions**» at **Politecnico di Torino** (a programme entirely given in English and hosting international students – see the video interview).

"With a digital twin of our Planet – Balsamo says - *it will be possible to give answers more accurately to the questions that institutional decision-makers may ask."*

For example, "*What will happen if we reduce CO2 emissions as indicated by the UN IPCC to limit global warming to 1.5 degrees? What will be the benefits on the ground by embracing green policies such as those of the European Green Deal? How will the air quality improve? And what will be the effects on human health?"*

In order to do this a large investment in infrastructure is planned. That involved **supercomputers** & cloud computing/storage platforms that allow to grind the humongous amount of data we are talking about. Without a **multi-national public investment**, each individual state would not be able to implement such an ambitious project, and equally that will involve the skills and the intelligence of many countries, not only in Europe.

At a time dominated by a pandemic, experts remind that the **risks** of an out-of-control climate or the deterioration of the environment and biodiversity are much more serious than pandemic ones and we need to apply prevention and mitigation measures.

The **health of the planet**, as well as our own, **cannot be managed if not measured**, and therefor measurements that allow to monitor the health of the planet are a must.

That is why there are investments in satellites and ground measurements both for monitoring CO2, which is the key driver of Climate-change, and for pollutants that disrupt the environment and shorten life expectancy.

The European **Copernicus** program, that started in 2014, already has several orbiting Sentinels and from 2025 will also have satellites dedicated to CO2 [1] thanks to the CO2M Mission (CO2M video here).

Starting in 2021, the second phase of **Copernicus (2.0)** program will be accompanied by an ambitious new initiative called Destination Earth (abbreviated to **DestinE**) that will revolutionise the computing capabilities and digital data distribution to support the new data economy with high-resolution and improved environmental and weather climate information.

Although interplanetary space exploration will fuel the imagination and dream of a space future, and is among the ambitions of many countries, one of the certain future destinations is the Earth if we can take care of it, exploiting existing knowledge and using the necessary courage and humility.

References

Copernicus European Programme to enable Earth Observation and its Resources
European Destination Earth program to lead the Technological and Digital Data Revolution.

1. https://www.ecmwf.int/en/about/media-centre/news/2021/ecmwf-led-co2-monitoring-project-deliver-prototype-system