TRANSLATION FROM THE ORIGINAL SUMMARY IN SPANISH

Seminar 'Digital Footprint: Servitude or Service?'

Catastrophic risks and climate change

(Summary of the session of June 18, 2020)

The fifth session of the Permanent Seminar 'Digital footprint: servitude or service?' took place on June 18, 2020. This time the central theme was ethical issues in the treatment and exploitation of data in weather forecasts and climatology, with a comment on data and algorithms in military operations.

Daniel Santos Muñoz, leader of the AEMET-HIRLAM project, presented the session, followed by comments from Ángel Gómez de Ágreda, Chief Colonel in the Geopolitical Analysis Area of DICOES / SEGENPOL.

From the extensive technical information presented, several cross-cutting issues can be deduced: the first relates to forecasting and measuring climate change in the face of possible limits in computing capacity to process the enormous amount of climatological data created nowadays. Moreover, the committee addressed the interrelation between public institutions and private interests and the private sector's role in the exploitation of climate data. A third issue has to do with the communication of climatological information, trust in measurements, and environmental education.

The impact of weather information

The importance of climatology can go unnoticed until certain events increase its relevance exponentially. An example of this is the impact that the 2003 heatwave had on Europe. During the summer of 2003, the WHO recorded 35,000 heat-related deaths on the European continent, the death rate in France increased by 54%. Added to the above are the economic losses of billions of euros due to harvest failure. In Portugal alone, the damage from forest fires cost 1.6 billion.

The impact of climate on society means that weather forecasting has been gaining more space in the media. This type of prediction is made with numerical methods in large programs that attempt to include the maximum number of components of the climate system. In 1860 the first scientifically based meteorological forecast was made thanks to the invention of the telegraph that served to transmit observations. This prediction is attributed to Robert Fitzroy, the British admiral who commanded HMS Beagle, a ship that carried Charles Darwin around the world. But it was in 1904 when Norwegian physicist Vilhelm Bjerknes laid the foundations that today allow expressing the evolution of the weather starting from an initial meteorological situation through physical laws.

Bjerknes proposed the so-called primitive equations. These differential equations can only be solved by approximation and require the handling of large volumes of data and millions of mathematical operations that only large computers can manage. In 1950, with the arrival of the first supercomputer (ENIAC), the first weather forecast was made with a physical-mathematical model of the atmosphere. In addition to an enormous calculation capacity, a large faculty for obtaining observations of the climate state is required for precise climatological prediction. The data from climate system records are collected from meteorological observatories, automatic stations, probe balloons, radars, satellites, buoys, ships, and planes globally. To the official providers of climate information has been added the data voluntarily provided by citizens, as well as the typical digital footprint data provided by social networks or by mobile phones. In recent years, many actors in the private sector (from fashion to the food industry) have discovered the interest that the most accurate knowledge of seasonal weather forecasts may have for their business plans. This has motivated private investments of several large technological groups in the development of new predictive models, competitors of those managed by states and public entities.

However, certain limitations condition the reliability of the forecasts: on the one hand, the chaotic nature of the climate system and, on the other, the limits of the computational capacity of supercomputers. The fact that small deviations, such as the one caused by the flight of a butterfly, can cause a tornado (the well-known effect proposed by Edward Norton Lorenz) is a big problem for weather forecasting. Added to this is the frontier of the miniaturization capacity of the processors that determine the computational size of supercomputers when the famous Moore's Law is no longer fulfilled (doubling every two years the number of transistors in an integrated circuit). Today, it is believed that this rate of integration is not sustainable. Nevertheless, new technologies such as machine learning and Artificial Intelligence have appeared. The revolution in quantum computing is expected for the relatively near future, which may mean new unprecedented advances.

For the armed forces, the use of data must be related directly with their practicality in solving problems and not so much on technological perfection. Along these lines, it is believed that there is a need to determine a minimum threshold of information necessary for decision-making. Above all, in the case where a quick decision is better than a perfect action, as long as the objective is achieved. In other words, systems should focus on efficiency rather than perfection. An example of this is given in the military field where the intention is to determine possible scenarios and not exact forecasts, and the emphasis is on continuous updating to adapt the strategy and behavior based on new data obtained from the front.

The threshold of the necessary information is essential to avoid the risk of "analysis paralysis" in areas where constant observation and data accumulation can lead to no-decision. The use of big data systems and algorithms can backfire if they mean an increase in the number of elements taken into account, without significantly increasing the precision of the global information.

In other areas where the seminar has worked, it has been observed that the exploitation of data through algorithms tends to increase knowledge of behavioral patterns and, ultimately, to influence or even manipulate these patterns. In the military experience, one can undoubtedly speak of the extension of data use towards manipulation or even falsification, within an essentially conflictive context. The abundance of data allows the application of different combat methodologies - the "hybrid war" that mixes weapons with other forms of confrontation - and better control of the war risk itself. In meteorology, attempts to manipulate reality are promised to fail, given the enormous amounts of energy that any effect on weather phenomena entails. And as for action against climate change, facts show that the changes necessary to limit global warming (decarbonization of the economy) are cumbersome and slow in their effects.

It is not the planet that is threatened by climate change but human life and habitat. Science has agreed on the fact of changes in the climate due to human activity, as well as the consequences that this can produce in the life of humans on earth. Nevertheless, there is a problem of risk perception. Despite data and scientific information, there is still a doubt, and some government leaders and private interests fuel denial of climate risk. But there are other public entities and other significant business groups that, on the contrary, are acting to move decisively towards the necessary changes.

One of the difficulties that slow down the change process lies in the lack of capacity to measure the environmental impact of the actions themselves, whether at the individual level, whether at the company or country level. A tremendous global cooperative effort - which unfortunately is currently facing growing obstacles in protectionist and nationalistic drifts - is essential to increase the ability to reliably and credibly measure the economic cost of non-action against climate change. Everything will become more apparent when these costs appear publicly and contrasted. When national and business accounting reflects the consequences of climate change and the risks involved, perhaps new synergies could emerge between the public and private sectors that would benefit the social whole.

Communication, trust, and environmental education

The problem of climate change is accentuated with the impossibility of communicating the large volume of information to individuals, companies, and rulers. There is a communication problem that is difficult to tackle. The climate change difficulty mixes an issue of trust that arises for those who sow doubt for their convenience (that is, the changes necessary to stop climate change would negatively affect the economy in many aspects) and the problem that derives from poor environmental education in general.

Public awareness of climate change will emerge with the advent of environmental education in the education system and with increased confidence in meteorological data, for which an adequate governance model is necessary. In line with knowledge, the important thing is that each individual is aware of the footprint he or she leaves on the planet and how it can impact a negative and positive way. Environmental education should be extended to schools, universities, and companies. The educational system will be useful if it is promoted globally from governments and must be based on working practical rationality. In this type of rationality, the amount of data does not give the decision, but the adaptation to the desired purpose, a task that only humans (and not machines) are capable of doing. That is to say, the characteristic of human capacity is not obtaining information, but making decisions.

FUNDACIÓN Pablo VI

Attendees:

1. **Alfredo Marcos Martínez**, Professor of Philosophy of Science, Universidad de Valladolid
2. **Alfredo Pastor Bodmer**, Economist, Profesor emérito, IESE
3. **Almudena Rodríguez Beloso**, Director of Institutional and Corporate Relations, VALORA
4. **Ángel Gómez de Agreda**, Colonel Chief, Geopolitical Analisis Area, DICOES/ SEGENPOL
5. **Ángel González Ferrer**, Executive Director, Digital Pontificial Council for Culture
6. **Carolina Villegas**, Researcher, Iberdrola Financial and Business Ethics Chair, Universidad Pontificia de Comillas
7. **Daniel Santos**, Project Leader AEMET - HIRLAM
8. **David Roch Dupré**, Researcher, Instituto de Investigación Tecnológica
9. **Diego Bodas**, Lead Data Scientist, MAPFRE
10. **Domingo Sugranyes**, Director, Digital Fingerprint Seminar
11. **Esther de la Torre**, Responsible Digital Banking Manager, BBVA
12. **Francisco Javier López Martín**, Former Secretary-General, CCOO Madrid
13. **Guillermo Monroy Pérez**, Professor, Instituto de Estudios Bursátiles
14. **Idoia Salazar**, , AI ethics expert, Universidad CEU San Pablo
15. **Idoya Zorroza** Professor, Faculty of Philosophy, Universidad Pontificia de Salamanca
16. **Ignacio Quintanilla Navarro**, Philosopher, Educator, Universidad Complutense de Madrid
17. **Javier Prades**, Dean, Universidad Eclesiástica San Dámaso
18. **Jesús Avezuela**, General Director of the Pablo VI Foundation
19. **Jesús Sánchez Camacho**, Professor, Faculty of Theology, Universidad Pontificia Comillas
20. **José Luis Calvo**, Director of AI, SNGULAR
21. **José Luis Fernández,** Director, Iberdrola Financial and Business Ethics Chair, ICADE
22. **José Manuel González-Páramo**, BBVA external adviser
23. **José Ramón Amor,** Coordinator, Bioethics Observatory, Pablo VI Foundation
24. **Juan Benavides**, Professor of Communications, Universidad Complutense de Madrid
25. **Pablo García Mexía**, Digital Jurist, Of Council Ashurst LLP
26. **Raúl González Fabre**, Professor, Universidad Pontificia de Comillas

27. **Richard Benjamins**, Data & IA ambassador, Telefónica
28. **Samuel Privara**, cybernetics, robotics and artificial intelligence expert