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Space for Earth and Climate Change – Public Value in a Risk Society

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Abstract

Today our society is confronted with the consequences of a triple crisis; a health crisis, an economic crisis and a climate crisis. Years of progress to reduce poverty and social divide, global cooperation and efforts to combat climate change are threatened by an abrupt change in our livelihoods. Indeed, responses to the COVID-19 pandemic led to increased tensions between states. However, if challenges emanating from these trends emphasise on the need to anticipate future risks and define measures to mitigate them, they also raise new opportunities, especially for the space sector to show its contributions to the greater good of the society.

As part of a research project in partnership with the University of Central Lancashire, the European Space Agency, undertook an analysis aimed at measuring the wider than economic value created by ESA programmes and activities as perceived by the European citizens. The results revealed a positive contribution to the common good.

This paper will now present an innovative approach to public value management, to take stock of the results found and use it in its wider policy and resource settings to maximise its contribution to the society, and mission and mandates.

At a time of existential crisis in which the anticipation of climate catastrophe caused by mankind drives public perceptions, policy and politics, this public value approach to optimising the impact of Space for Earth, brings imagery and insights into the everyday lives of ordinary citizens.

Using public value and the risk society framework to unlock the potential of satellite imagery and information, we show how the impact of ESA's Space for Earth missions may be optimised. We do this by focusing upon the existential risks associated with climate change to the constellation of universal human value categories, which now bear upon everybody, everywhere.

The practicality of this presentation will be to draw upon high-resolution images from *inter alia* Copernicus, to show the impact of humanity upon the natural environment. This paper will further give insights for action and communication essential to mobilise citizens in the co-production of solutions to mankind's most pressing problems.
Keywords: (maximum 6 keywords)

Acronyms/Abbreviations

1. Introduction

This paper is the continuation of a work on Public Value Management. It is the result of a collaborative research project between the European Space Agency (ESA) and UCLan's Applied Policy Science Unit (APSU). The previous research was based on a conceptual framework that draws upon a distinctive synthesis of theories of public value, human values and needs and sought to provide a comprehensive analysis and framework for the measurement of the wider perceived public value of space agencies like the European Space Agency (ESA) [1].

Faced with the added complexity caused by COVID-19, some risks and trends have been exacerbated, with new types of risks emerging. Green growth, resilience, trust, digital sovereignty, are such issues that have been put forward by political discourses since the beginning of the pandemic: a new lexicon to which we are now being accustomed to, and symptomatic of the unique nature of the situation we are currently facing. What will be the world of tomorrow and how we will ensure to "Build Back Better" is a crucial question that all public and private sectors decision-makers, citizens, and consumers are asking themselves? Future short-term decisions can have lasting consequences.

In the past research, we showed the importance of engaging in human centric approach to strategy, putting people at the centre of future developments and ensuring their real needs are addressed. Indeed, global citizens are becoming more and more engaged and take upon their opportunities to participate in the public discourse. They

also have a lot more expectations and the environment to account for their complexities. All this leads to a situation where international and inter-governmental organisation are strongly encouraged to become more transparent, effective and engage in direct exchanges with the public.

In this paper, we attempt to better understand the environment and world of risk in which global citizens are living, building on the research from Ulrich Beck and his theory from the risk society. Applied upon the very case of Climate Change, we set the ground for a new methodology to show how satellite Earth Observation data, contribute to bringing insights to ordinary citizens and decision-makers. Indeed, so far, the pandemic has also been an opportunity for space to present itself as a solution to societal challenges and respond to human value needs. The Rapid Action on Coronavirus and EO is such an example. Established during the pandemic from a cooperation between the European Commission and ESA, the dashboard showcases illustration of socio-economic and environmental changes via Copernicus Services. It did not only capture effects of the lockdown but can also show how Europe is beginning its recovery and is relaunching several activities [2]. In a second stage, and following outcomes from the conference, we will attempt to test the present assumptions by questioning the society using the Public Value Management framework.

The main hypothesis poses that by providing data and insights to the wider public, and public institutions, earth observation data and analytics contributes to universal and security human values. The underpinning changes which cause climate change are invisible. They require a system like Copernicus to make visible the impact of humanity upon this island Earth.

First, the theoretical background of the risk society applied to today's risks and trends is presented. Building on results from the Public Value work the paper recalls past research and findings and explain how human values fit within this wider context of a risk society. In a second part, the concept of space for earth is developed going from the global impact of climate change to the solutions provided thanks to earth observation data in practice and their impact to the local lifeworld of the citizens. Finally, the paper concludes by presenting the general hypothesis based on the research, to be tested with citizen's consultation.

2. Theoretical Approach: A world risk society

2.1 A World Risk Society

In 1986, only a few days after the Chernobyl nuclear incident, Ulrich Beck published the Risk Society in which he theorises the concept of risk i.e. the probability of occurrence of a negative hazard. This work, which was both a massive and rare public success for this type of publication, has had a lasting impact on the human sciences as a whole and has established the notion of risk as an essential concept in any analysis of the society. At a time when the COVID-19 pandemic is fully confirming observations made in this seminal work, it is also, and above all, the more normative part of this thinking that should be re-read today. In the current slump, faced with existential uncertainty, the paths opened by Beck more than 30 years ago certainly constitute valuable guidelines capable of renewing both our intimate relationship with risk and the political response to it. Returning to Ullrich Beck's thesis of the risk society allows us to better understand the new relationship between knowledge and power that is needed to overcome collective inaction on global challenges like climate change.

According to Beck, the end of the 20th century would have seen the transition to the risk society. This does not mean that our society has become more dangerous than a century ago, but that risk has become omnipresent. Risks have changed in nature and scale and the society is now confronted with its own manufactured risks. Science is seen as both a source of progress and danger, and the more science and technology evolve, the more they discover new risks and become producer of risks. Science is no longer a source of certainty, rather the new knowledge increases the areas of uncertainty. Thus, a risk is only considered as such when the population perceives it this way. For Beck, these risks are threats that escape our senses. They are invisible, like pollution or viruses or climate change and are often externalities of human production. This does not mean that Beck rejects all technical or scientific developments, but the observation that science and progress produce risk does, however, require a politicisation of the techno-scientific spheres that have been developed for too long in the absence of public scrutiny.

2.2 Public Value in a Risk Society

In a "World Risk Society" there is now more than ever the realisation that what was considered progress can now be part of a problem. Increasingly, institutions and interests associated with economic growth are seen as part of the issue. A new mode of valuation beyond material self-interest is required. A 'Public' Value embedded in our daily lives extended across the globe.

The theory of the risk society has massive public value implications, to the detriment of the public sphere. Where human-made induced disasters and climate change have lasting impacts that can be seen through four key themes:

- **Globalisation** – New risks like climate change extend over the globe and require concerted efforts and actions both above and below the level of the nation state,

- **An imposed individualisation** – lack of state control and agency requiring more active engagement by individual citizens,
- **New type of risk** – which is again invisible, man-made, uninsurable, delimited across space, time and society – the unintended consequences of science and society,
- **New politics of co-production –** are required especially for climate change, as a result of the consumption and production of citizens across the globe (i.e. from forest fires in the Amazon to the over use of hydrocarbons). Individual citizens need to be mobilised across the globe to address climate change. They both need to be made aware, and incentivized to act via informed policy-decisions.

Public Value is a concept centred around the common good. The benefit (or detriment) to society of something. In this case climate change, has a massive negative public value implication and impact and comprises of three key elements:

- **The social condition(s) that need to be addressed** - seen through the lens of human values, needs and motivations
- **The capacity to address the condition**, concrete methods including information and resources necessary to understand and address it.
- **The legitimacy and support required to address the condition**, involving the mobilisation of the citizenry the legitimisation of funding and public resources and the facilitation of a coherent, collective conversation about it in the public domain.

All humans have a human value system and a number of universally important value types. But we differ in terms of the relative importance of these value types even though we appreciate and respect them all, which is why it is so difficult to measure. Just like risks, they are invisible, situational, and intangible like clouds, impact is plain to see.

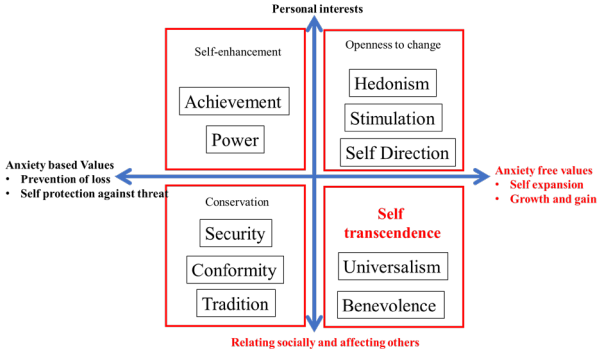


Fig. 1 Human Value dimensions

Understanding the concept of the risk society and how climate change fits in this theory today, helps us to better apply public value conditions needed to act upon it. Our public sphere extends beyond our local horizons to the entire globe. Public value from a climate change standpoint focuses upon the individual and the whole society, a perspective based upon universal human values.

Looking at our planet, one world. we acknowledge the death of nature. A global problem in a world that is increasingly dominated by risk and requiring a global solution based on information and a global perspective. But global action goes through real lives of the citizens. Each individual action counts to counter threats from climate change requiring facilitated channels of communication and better access to information so that politics and policy of values can be more effective in relating climate change issues and solutions to the daily lives across the globe.

2.3 2021 Global Risks

Today, the World Risk Society, is a world increasingly beset by human-induced 'bads' such as nuclear waste, chemicals, plastics, hydrocarbons and climate change. It is a world in which we have come to appreciate the catastrophic consequences of human actions upon the planet, the goods we produce and consume in our daily lives creating consequences which spread around the globe and across all society over time. The underpinning changes which cause climate change are invisible.

COVID-19 crisis has affected everyone deeply in a short time. Nonetheless, global challenges should not be set aside, rather their inherent nature should be understood and made aware properly to ensure sustainable actions are put in place and potential risks are foreseen and mitigated.

In times of unprecedented levels of uncertainty and global crisis, environmental, social, and digital challenges are still making the top of the list both in terms of priorities in political agenda and global risks.

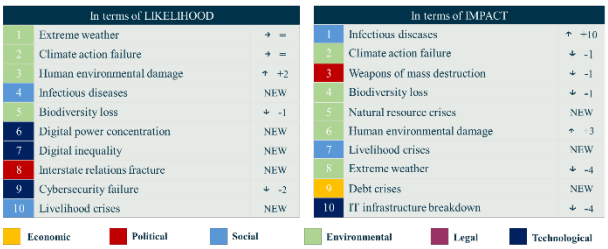


Fig. 2 Top Ten 2021 Global Risks and evolution from 2020 (WEF, 2021 and 2020)

2.4 Public Value in the Space Sector and at ESA

In Space Sector, a couple of main trends can be observed and will likely drive developments for the next decade.

1. The ***relationship between climate change and space*** is growing
2. The increasing ***number of satellites in space*** puts priority on the mitigation of orbital ***debris*** and creates opportunities for private companies to manage and track this waste
3.
4. The ***value extracted from satellites*** operators can be seen ***across the three GEO, MEO and LEO*** altitudes. While GEO underpins the industry, the telecommunication industry within LEO looks to provide other types of broadband services and using different approaches (i.e. aerospace, in-flight connectivity…)
5. There is an ***increased need for space domain awareness*** by both the public and private sector. This is mainly a result of the increasing tensions between the space faring nations to gain leadership.
6. Despite the economic recession because of COVID-19, ***private investments in space have peaked***. Investors look for innovative ideas to complement the old space capabilities. Furthermore, to counter the high risk and low access to finance issue, SPACs (Special Purpose Acquisition Companies) may be a solution.

Those trends affect the way ESA's space activities are perceived by the public to produce value across the entire human value gamut. Indeed, space activities provides much more than simply quantifiable performance indicators. It is spanning so many areas that it is difficult to find the one single value for space. In the context of climate change, the concept of the risk society can help us to better apply public value conditions needed to act upon it using space capabilities.

Our public sphere extends beyond our local horizons to the entire globe. Public value from a climate change standpoint focuses upon the individual and the whole society, a perspective based upon universal human values – values associated with the safety of the self to those of the state and of the society.

As shown from past research, ESA space activities contributes to a large extent of human values as perceived by its citizens.

Fig. 3 ESA missions contributing to human values

For instance, ESA earth explorers' satellites are research missions designed to address key scientific challenges identified by the Earth science community while demonstrating breakthrough technology in observing techniques contributing to our basic needs. Alphasat is one of the largest telecommunication satellites to date and helps us communicate with one another. Finally, Juice contributes to our growth via the understanding the universe.

3. From global to local life-worlds impact

Earth Observation activities from space answer to two different objectives: to answer to large fundamental questions such as how did the Earth evolve to what it is today and how it is changing? But also, to look at more specific phenomena (i.e. earthquakes, hurricanes) and provide answers to global challenges today including to guide in pursuing the United Nations Sustainable Development Goals related to climate. Efforts are global, with individual states focusing on various technical areas.

Changes in the Earth Observation field also include the emergence of smaller players and new global collaborations able to work on many more specific projects (i.e. using very small satellites called nanosatellites). The field has already received some attention from COP25, and this trend will likely continue. The European Commission and ESA flagship programme: Copernicus, is operational since 2014 and is now composed of 8 satellites called Sentinels operating in orbit around the globe observing different elements. Ten more are foreseen to be launched by 2030. The programme provides free and open access to the collected data on a global scale.

Satellite data from application programmes (i.e. Earth Observation, Navigation and Telecommunication) can provide public value in a "Risk Society" in three vital aspects: Globalisation, Individualisation and Localisation.

3.1 Global Human Impact: ***Globalisation***

The Copernicus programme reveals a unique and vital perspective of the global public sphere and universal value beyond the limitations of nation states.

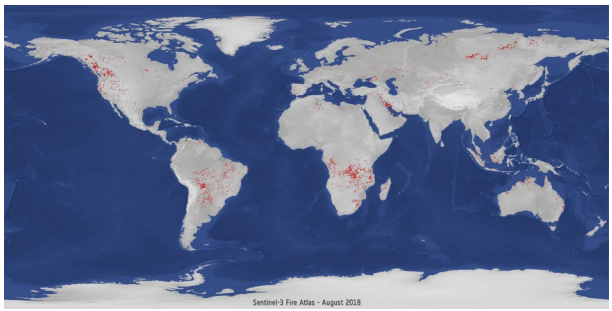


Fig. 4 Global fires detected in August 2018 compared to August 2019 (Source: Copernicus)

The above image is taken from the Sentinel 3 animation showing World Fire Atlas. 79 000 wildfires gave been recorded in August 2019 as compared to just over 16 000 fires during the same period in 2018. Through this image. Copernicus imagery reveals the 'boomerang effect' of huma activity upon the natural environment and upon us. The imagery of the world we live in and our impact upon it is seen through a global lens. It informs the global community of the danger around the world. The unforeseen impact of human production and consumption coming back to us as risk associated with climate change is revealed. Here we see the essential perspective of our contribution to the crisis and our daily lives - to each other and to distant strangers across the globe. In public value terms, our relatedness with the global public sphere is visible, just as Alphasat enables us to communicate with people all around the world. This reinforces the global nature of World Risk Society in the face of issues like climate change.

3.2 Detailed Measurements: ***Individualisation***

Scientific studies using satellites are of two types: either to observe the universe or the Earth. Using detailed measurements and analytical use of Copernicus data, solutions to environmental problems can be better designed. Many of the current and foreseen space projects are technoscientific solutions to socially produced environmental risks (manufactured risk) of various kinds on Earth.

However, while Beck mostly considers human induced disasters, space technologies can contribute to mitigating and preventing natural disasters as well. Earth Observation can help to track deforestation, climate change, arctic as much as ozone depletion, oil spills etc. Combined with other types of applications it opens avenues to new solutions in the anticipation of future challenges. Everyday Earth Monitoring projects like these are necessary solutions to Earthly ecological risks.

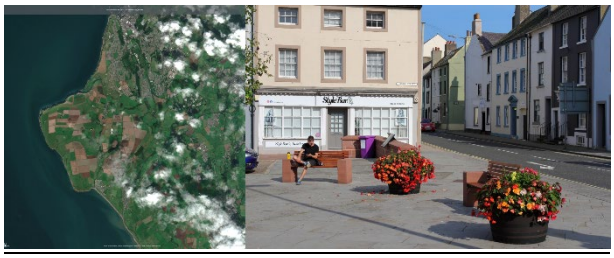
Fig. 5 Flood delineation map of West Cumbria during the 2015 floodings

A succession of Atlantic Storms hit Ireland in the winter of 2015-2016 resulting in the heaviest flooding in the country's history. In response to the flooding, the Irish flood management authorities triggered for the first time in December 2015 the Copernicus Emergency Management Service. Using Sentinel-1 and other satellite data, this service provided all actors involved in flood management with flood delineation maps. These maps have enabled informed decision-making and produced significant economic and social benefits for all actors involved in flood management, from national coordination level down to individual citizens. Through a series of case studies, EARSC aims to gather quantitative evidence that the usage of Copernicus Sentinel data provides an effective and convenient support to various market applications. These studies are undertaken in the frame of the project "Showcasing the benefits brought by the usage of Sentinels data to society, environment and economy: a bottom-up assessment based on traceable impacts along selected value chains", under an assignment from the European Space Agency (ESA) funded by the European Union as part of the Copernicus Programme.

The satellite image shows the consequences of the side effects of human actions, made visible as the risk of climate change always there, in citizens minds. The perception of citizens is of a world of risk, of existential risk one which spreads across the globe, unifying all humanity in the causes and consequences of their actions as individuals. This also reinforces the impact of man on this island Earth – it is a definitive Risk Society risk, invisible, distanciated across space and time, uninsurable, irreversible (essentially) and created as a consequence of human production, consumption and science against that science from Copernicus, providing positive contribution to the society.

3.3 Local Life-Worlds: ***Localisation***

Copernicus thus reveals the ultimate public sphere, at the global level empowering individuals and enabling them to connect with one another and related to distant strangers. Such elements create a global public sphere – a community of individual lifeworlds.



The localities we live in are in the front line of the World Risk Society. They are where we consume, produce and contribute to human induced climate change. Copernicus and information and imagery connects places everywhere with global issues and the global community. This helps localising issues and yet also delocalising the consequences and burden of our actions and activities as seen through a global lens. The perception of humans with this information is that their individual lifeworlds are under threat as part of a global system. They perceive that today, as globalise individuals, their public sphere extends beyond their horizons and across the globe. Moreover, the consequences of climate change affect all aspects of the common good. Climate change is a common "bad" and the perception of citizens (if effectively messaged) is that a global public has been called into existence and that regional and national boundaries no longer apply as global society addresses climate change.

4. Public Value and Climate Change in a Risk Society

Copernicus reveals the ultimate global public sphere, an essential perspective in addressing human induced climate change in a world risk society. A public value approach focuses upon the common good and gives a global narrative that is:

- **Globalising** – revealing the global public sphere as one world

Satellite imagery, accessible to anyone, everywhere, reveals the full extent of the global public sphere, humanity's home on an isolated planet in space.

- **Humanising** – respecting real lives and universal human values.

It stresses the finitude of resources, the need for stewardship and the unity of humankind: it makes visible the invisible spread of the causes of human induced climate change, creating an imperative to act as at an individual level yet on a global scale

- **Localising** – relating issues to our 'lifeworlds' and our own places and daily lives.

Imagery from Copernicus shows the impact of mankind's actions upon the environment and how it affects all humanity – it related us and emphasises on the need to act upon our daily lives, in the spaces and places we inhabit and the front line in addressing climate change.

Acknowledgements

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