

# Drone Use for COVID-19 Related Problems: Techno-solutionism and its Societal Implications

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## Abstract

Drones have been widely used by public authorities during the COVID-19 pandemic for pandemic-related problems. As an innovative tool with a wide range of potentialities, they have been deemed suitable for an exceptional situation marked by the persistence of social distance. Yet, the turn to new technology to solve complex problems is a political decision that has broad societal implications, especially in the context of declared states of emergency. In the article we argue that the extensive use of drones by national authorities during the COVID-19 pandemic has generated a new socio-technical assemblage of actors, technologies and practices. Building on the three main uses of drones as responses to specific pandemic-related challenges (disinfection, delivery, and surveillance), we analyse the actors and the practices involved in this new socio-technical assemblage. From the empirical material, we explore potential effects of drone uses on key issues such as the technology regulatory processes, public acceptance, and security and safety concerns.

## Policy Implications

- Accelerating regulation to allow civilian drones to fly more in civilian airspace during the pandemic cannot reduce safety and privacy protection standards.
- As drone technology is continuously evolving and is potentially exposed to function creep and function expansion dynamics, its societal, ethical and legal implications should be continuously reviewed.
- The public and the civil society – and not just end-users and developers – must be consulted and involved in the processes of regulating new technology and their integration in our societies.
- The social and political impacts of technology must be debated publicly and politically, as the reliance on technology to solve complex problems often has wide societal implications beyond the specific problem at stake.

The fight against the COVID-19 pandemic has mobilized national resources of all types – human, material, political and financial – on a large scale worldwide. While the approaches adopted all over the world have differed from one country to another, an underlying trend connecting many of the measures implemented to fight the pandemic has been the growing importance of new technological solutions to address different problems associated with the crisis. Emerging technologies such as artificial intelligence-based streaming analytics, or high-resolution smart cameras have been used in many contexts, and often coupled with platforms such as unmanned aerial systems (UAS, commonly known as drones) and cellphone apps. They have performed specific tasks, like geolocating people to communicate risks of infection, and have generated data for specific purposes, such as creating patterns of dispersion of the contagion to

anticipate future outbreaks. Several countries have imposed or suggested the use of self-tracking apps, often developed by private providers, in people's cellphones aiming at constructing a map of both actual and potentially infected individuals, so that ensuing social distance measures could prevent the spread of the SARS-CoV-2 virus.

This reliance on technology in times of crisis raises a series of political, ethical, security, safety and legal questions. As part of a necessary critical engagement with them, this article explores the deployment of drone technology during the COVID-19 pandemic by national authorities. Owing to its distinctive features, in particular its character as a platform for carrying other technologies, drone use for COVID-19-related problems is a good illustration of a technology-mediated political response to a crisis. Based on an in-depth analysis of its use during this pandemic by national

authorities, this article aims at offering broader insights into how emerging technologies employed for societal security might have a deep, and perhaps lasting, effect on our societies. We build on the literature on technological fixes and techno-solutionism that critiques a predominant confidence in new technology as ideally placed to respond to particular problems (Johnston, 2020; Milan, 2020; Morozov, 2013; Rosner, 2004; Stilgoe, 2020). Informed by conceptual tools emanating from the fields of regulatory studies, critical security studies, and science and technology studies, we build a main, three-layered argument in this article: (1) the prevalence of techno-solutionism as an ideology of public policy, materialized *inter alia* in the extensive use of drones by the national authorities during the COVID-19 pandemic, has created a new socio-technical assemblage of actors, technologies and practices (Monsees, 2019; see also Bellanova and Duez, 2012); (2) this, in turn, has generated a number of relevant societal effects that cannot be overlooked; (3) yet, the combination of the techno-solutionism logic with the exceptional character of this global pandemic makes this new socio-technical assemblage harder to contest by the public.

We navigate a wide, contemporary societal transformation characterized by two inter-related dynamics: first, an expanding part of social and political life is mediated through new technologies; and second, new technologies are increasingly seen as a solution to different problems. While new tech-based responses to COVID-19 remain a moving target at the time of writing, we have drawn our argument from a preliminary identification of main trends, risks, and potential societal implications. Our analysis focuses on the implications of COVID-19-related drone use by national authorities for liberal democracies, where contestation, public acceptance, and regulation have different manifestations than in non-democratic regimes. At the same time, drone use for COVID-19-related functions has been widely observed globally, and our systematization of its main functions builds on illustrations from different parts of the world. This breath of coverage is important to highlight that techno-solutionism via drones is a wide phenomenon that justifies further academic attention.

Our cautionary approach involving an ever-growing technologization of society does not deny the benefits of technology; rather, it aims at providing an alternative discourse to the prevailing techno-optimism that often surrounds innovation and technological development and push societies to focus on permanent technological innovation rather than maintenance of existing infrastructures (Vinsel and Russell, 2020).

In the following sections, we first revisit key concepts within the above-mentioned literatures to explore how the acceleration of the processes of technology integration challenges law and regulatory design, public perception, and acceptance. It also stimulates function adaptation and potential function creep, which then opens and normalizes even more potentialities while creating new security and safety problems. We then highlight how drone use during the pandemic brought about three specific technological fixes (disinfection, delivery, and surveillance) and widened pre-existing practices. Finally, we make a critical assessment

of the societal footprint of these drone-based technological fixes, opening the debate around the main implications of this new assemblage of actors, technologies and practices.

## Conceptual tools

The emergence of a new sociotechnical landscape resulting from the development and use of new technologies requires an adaptation from the society. This adaptation takes many forms, from elaboration and revision of laws and regulations to definition of social norms and political behavior. We follow Brownsword et al. (2017, p. 4) in understanding that, in a context of rapid technological change, ‘the contours of legal and regulatory action are not obvious, nor are the frames for analysis’ (see also Brownsword, 2019). Against this backdrop, regulatory frameworks are shaped to address societal needs with a certain flexibility to be adapted over time. However, regulation does not change only in face of the availability of new technologies. External factors such as exceptional events (like environmental disasters, public health crises or terrorist attacks) can trigger new regulatory responses and impact what would have been a normal process of integrating new technologies in society.

In a regular process, regulation is introduced following strict procedures; these take time, as regulation needs to be effective and sustainable in the long term for the collective benefit. In contrast, technological development is often conceptualized as a solution for addressing a current market need or an immediate societal problem, typically with a short-term perspective and requiring quick implementation, with an individualized, often private, benefit co-existing with the potential collective benefit. How to conciliate both dynamics remains a key challenge of our modern societies. Exceptional events such as the above-mentioned further complicate this equation.

In this respect, Hildebrandt (2016, pp. 11–12) underlines how ‘technologies regulate our behaviours by making certain behaviours possible and constricting others’. She argues that ‘technological regulation is often a side effect of a particular design aimed at a specific functionality’, which might determine a new behavior and eventually a new norm – this, in turn, may challenge ‘legal regulation’, i.e., laws initiated and elaborated by the legislator (Hildebrandt, 2016, pp. 11–12). Hence, she points out how technological regulation has also challenged our understanding of how norms are constructed and based on some key assumptions of accountability, legitimacy, legality and responsibility, especially in liberal democracies.

These dynamics become increasingly relevant in cases where a technology is used beyond its original purposes – a phenomenon often defined as function creep. While the concept has vast usage and currency in both academy and industry circuits, it is often used without enough accuracy. In this respect, Koops (2021, p. 27) argues that:

what is distinctive of function creep (as opposed to simply function expansion or innovation) is that it denotes some qualitative change in a system’s function that causes concern not only because of

the change itself, but also because the change is insufficiently acknowledged as being transformative and in need of discussion.

For that reason, it is important to distinguish between function creep and function expansion. The two phenomena, besides requiring different regulatory responses, are also potentially interpreted differently by the public. Both the issues of safety and function expansion/function creep may have implications in terms of public acceptance of technology, especially if we acknowledge that 'new technologies foster the diffusion and decentering of security practices' (Monsees, 2019, p. 531). The public contestation of emerging technologies is 'thus equally diffuse and require an understanding of "publics" that can account for the diffuse situation from which they emerge' (Monsees, 2019, p. 532). Hence, the acceleration of the processes of technology integration, and the new practices coming along with technology development, challenge law and regulatory design, but also public perception and acceptance.

In crisis scenarios, and especially under a declared state of emergency, these processes regulating technology integration may have relevant societal consequences. Fast integration of technology and new practices can create new security issues, to which countermeasures may not exist or may not be sufficiently adequate. As showed by Martins et al. (2020a), Michel (2019) and others, and as explored below, that is the case of counter-drone technology, where the technological state of the art is yet unable to answer the risks posed the integration of drones in the civilian airspace.

These concerns are part of the new security problems that emerge from the proliferation of civilian drones. This aspect is explored below through the notion of 'surveillant assemblages' (Haggerty and Ericson, 2000). As new technology's presence in society grows, the way surveillance takes place has changed. The new surveillant assemblages operate by 'abstracting human bodies from their territorial settings, and separating them into a series of discrete flows. These flows are then reassembled in different locations as discrete and virtual "data doubles"' (Haggerty and Ericson, 2000, p. 605, see also Bigo, 2014). More recently, Lyon (2018) has shown how today's culture of surveillance requires the direct participation of the ones being surveilled. Such participation happens on a spectrum, from open and voluntary participation to full ignorance and lack of awareness, and this engages the public in novel ways – as revealed in the different national debates surrounding the introduction of self-tracking apps to monitor COVID-19 infections. As a platform to which different surveillance devices can be coupled, such as high resolution video cameras, thermal cameras, or geolocation trackers, drones are crucial elements in the politics of the vertical (Bracken-Roche, 2016; Weizman, 2017); they contribute decisively to a contemporary expansion of surveillance in urban areas by generating data of different nature (visual, thermal, geolocational), feeding into the surveillant assemblages in different or complementary ways; this, in turn, opens for deeper analysis on what surveillance as a practice is and can/could become.

Underlying to, and connecting, these scholarly debates lies a wider societal trend of reliance on new technology to solve problems of all natures. Critical literature on techno-solutionism has highlighted that, despite its benefits, technology poses new challenges that are often overlooked if we have acritical faith in it (Johnston, 2020; Morozov, 2013; Rosner, 2004). Milan (2020), for example, has shown that tech-based quantification in the fight against COVID-19, as well as the socio-technical infrastructure 'devised to curb the social and economic costs of the virus', such as tracing apps, only have a 'certain type of user in mind – suitably digitally literate and sufficiently wealthy to own a state-of-the-art smartphone' (Milan, 2020, pp. 2–3). While the terms techno-solutionism and technological fix have limited theoretical possibilities, they nevertheless open up the door for analysing the socio-politics of technology development and integration. As explained by Stilgoe (2020, p. 22) in his engagement with Morozov's (2013) work, the justification of technologies as solutions to social problems is intensely political: 'some problems get prioritized while others are overlooked and, in making social problems amenable to engineering solutions, the problems are changed in ways that suit innovators'. As demonstrated in the following sections, the turn to drones as a means to fight the pandemic illustrates these intensely political dynamics.

From these different bodies of literature we build a framework that guides our analysis of drone use during the pandemic. That framework focuses on the logics of techno-solutionism and socio-technology assemblage and enables us to critically analyse the acceleration of the processes of technology integration, how this stimulates function expansion, and how this produces effects on society, including creating new security and privacy vulnerabilities.

### Three main technological fixes by drones during the pandemic

The growing availability and sophistication of drones, as well as their capacity to be coupled with other technologies, led to their utilization during the COVID-19 pandemic to execute a broad range of tasks. This is not surprising; previous use of these devices to address global health issues, for instance during the Ebola and Zika outbreaks, has generated knowledge and best practices that now facilitate its usage (Sandvik and Lohne, 2014). This has triggered widespread hype and optimism about drones' capacity to fight pandemics, in particular during the first months of the outbreak (for a cautionary tale see Martins et al., 2020b; Meyer, 2020). For national authorities, law enforcement agents, and military and health personnel, drones have emerged as a suitable solution for COVID-19 related problems. In the challenging context of social distancing where close contact between humans is restricted, drones' attributes make them appealing. We have identified three main tasks that drones have been assigned by national authorities during the pandemic to solve specific problems: to disinfect, carry, and surveil, including through temperature scanning.

## Disinfecting surfaces

As preliminary studies showed that the SARS-CoV-2 virus could potentially survive for long periods on surfaces and remain infectious, finding an efficient way to disinfect public spaces became a priority. A multitude of drone manufacturers have advertised products as 'spraying drones' (see for example Perez, 2020, for DJI) and authorities in several countries – including China, France, the United States, India, Philippines, Colombia, Chile, Spain and the United Arab Emirates (Sharma, 2020; Williams, 2020) – have used them for disinfecting public areas while minimizing both human-to-human contact and any human contact with potentially infected surfaces. Equipping drones with spraying functions is not a new attribute, as the technology has been used in a similar way for spraying pesticides at agricultural sites. Yet the objective of these spraying drones, namely, to disinfect public areas to avoid the spread of a virus, is an example of function expansion to face a new problem.

In Spain, the first country in Europe to mobilize this new application during the pandemic, the Spanish Military Emergency Unit (UME – Unidad Militar de Emergencia) used drones to disinfect large outdoor areas (Gobierno de España, 2020; Pan, 2020). The models used were DJI's Agras and the DRONEHEXA XL by DroneTools (Lewis, 2020a); both types were originally intended for agricultural spraying. In Indonesia, DJI Agras drones have been operated over urban areas by the Indonesian Air Force, Indonesian Aero Sport Federation (FASI), and the South Jakarta COVID-19 Task Force (Lee, 2020). At the NUI Galway's Health Innovation via Engineering (HIVE) lab in Ireland, instead of spraying drones, researchers attempted to develop drones emitting UV light as a way to sterilize surfaces (Young, 2020). In all these instances, the reasoning behind development or employment seems to be that drones are safer and more effective than manual spraying or other forms of disinfecting.

However, some authors argue that spraying disinfectants has little or no effect on disease control (Meyer, 2020; Xiao and Torok, 2020). According to the World Health Organization (WHO), spraying outdoor areas is 'not recommended to kill the COVID-19 virus or other pathogens because disinfectant is inactivated by dirt and debris and it is not feasible to manually clean and remove all organic matter from such places' (WHO, 2020). In fact, mass disinfection campaigns could cause a public health hazard in their own right. Spraying disinfectants can result in 'risks to the eyes, respiratory or skin irritation and the resulting health effects', even if spraying occurs outdoors (WHO, 2020). The use of disinfecting drones illustrates a case in which technology is employed to solve one particular issue but may create a new problem entirely.

## Cargo delivery

Countries worldwide have imposed partial or complete lockdown measures in order to combat the pandemic. This creates difficulties for many people to obtain goods and services. Cargo delivery drones have been promoted by various public and private actors as a safe and efficient way to

make purchases or deliver essential goods while limiting human-to-human contact. The settings in which drone delivery have been presented as a solution during the pandemic are far reaching, from delivery of non-essential commodities in urban areas, to blood sample transits, to aid deliveries in developmental contexts.

During 2020, we witnessed an acceleration in the use of drones to deliver goods, both in pilot tests and in real contexts. In test locations in the US and in Australia, the tech company Alphabet has seen a surge in demand for deliveries by drones (Porter, 2020), which has largely been related to customers adhering to social distancing guidelines (Levin, 2020). Unlike spraying drones, which are primarily operated by state authorities including the military, drone cargo delivery services are mainly operated by private actors, except in the case of medical supplies, where public health authorities have been involved. In several countries and regions, new regulatory frameworks have been intensively discussed in recent years to open the sky especially for these new drone cargo delivery services, which will be largely operational in the upcoming years once the regulation will be fully implemented (Csernaton and Lavallée, 2020; Lavallée, 2019). However, drone use during the COVID-19 pandemic has certainly provided a way for companies to positively brand, and secure the market for, their products and services.

National health authorities have looked at the delivery of medicines and medical supplies, mainly for transportation to, and from, labs and medical facilities. A study undertaken by Linköping University in Sweden suggests that mass testing would benefit from drone deliveries of test kits to homes by limiting the spread of the infectious disease through human-to-human contact (Sedov et al., 2020). In Germany, tests have been conducted to deliver COVID-19 test samples to labs by drone, in an effort to speed up the process of moving tests from mobile facilities to labs for inspection (McNabb, 2020). For heavier loads, the UK government has announced that drones could be carrying personal protective equipment (PPE) from the English mainland to health workers on the Isle of Wight (Usher, 2020). In Canada, the federal government funded a pilot project for shipping protective equipment and testing supplies to Ontario First Nations communities by drones to get around transportation problems (Farooqui, 2020); and in Alberta, health services and universities are developing similar initiatives (Graveland, 2021). In Rwanda and Ghana, the tech company Zipline has been running operations to deliver medical supplies by drone to rural health centres (Lewis, 2020b). Hence, the pandemic stimulates function expansion in the use of drones to reach people in isolated locations and remote areas.

## Population surveillance

Pandemic mitigation efforts such as social distancing require broad societal acceptance and compliance in order to be effective. However, it may be difficult to guarantee that people are aware of up-to-date information about mitigation measures, and authorities may be incentivized to keep tabs on the population's adherence to lockdown and social

distancing regulations through surveillance. Drone use with the purpose of guarding or watching the population for the sake of control have taken two main forms: audio message communication and video surveillance.

For communication purposes, in many locations around the world, drones have been equipped with speakers to convey direct messages about social distancing or lockdown measures. In Nice, France, police deployed drones piloted by the company Drone06 which repeatedly broadcasted the message: 'A reminder of the instructions relating to the COVID-19 pandemic: all travel outside the home is prohibited unless exempted. Please respect a safety distance of at least one metre between each person' (RFI, 2020). In other instances, drones have been employed to reach specific areas or parts of the population. In the Greater Tzaneen municipality, South Africa, drones have been deployed with a similar purpose (de Klerk, 2020), and the same happened in different municipalities across Europe.

Drones have also been equipped with cameras to collect images and surveil citizens' adherence to social distancing measures and local lockdowns. In many contexts, this practice has required regulatory adaptation. In Italy, the Civil Aviation Authority (ENAC) confirmed the quick approval on 23 March 2020 for local police units to use drones to monitor social distancing (Holroyd, 2020) – in Brescia, for example, the technology was used to alert the police of people not respecting the lockdown, resulting in the police deploying to the area in question if deemed necessary (Corriere Della Sera, 2020). Authorities in Malaysia have established the 'Malaysia's Movement Control Order' (MCO), which includes employing drones to monitor and control its citizens (Lewis, 2020c). The drone programme is being run by Malaysia's Armed Forces and used to aid the police in managing the COVID-19 situation. In the UK, police published footage obtained by drones to publicly shame individuals walking their dogs in a remote area during the lockdown (Bienkov, 2020).

### **Temperature scanning**

Fever detecting drones have been used during the pandemic. Thermal image technology has in fact a history in disease containment: it was adopted, for example, by several Asian countries after the 2002–2004 SARS outbreak (Borsuk, 2003). Now, drones are being equipped with similar features, creating aerial monitors that collect health data through either thermographic or computer vision (Greenwood, 2020). To date, such technology has been employed for example in India, Italy, Oman, the US, and China, and several companies have made bold statements about what their technology can do. The Chinese company Alibaba has claimed that its drones can, through AI systems, detect coronavirus infections with 96% accuracy (Jakhar, 2020). The Canadian company Draganfly claims that its 'pandemic drone', through equipment of sensors and computer vision systems, can 'display fever/temperature, heart and respiratory rates, as well as detect people sneezing and coughing in crowds' (Draganfly, 2020).

Despite the media and commercial hype, actual evidence of the functionality and practicality of thermal sensor fever

detecting drones remains vague at best. Greenwood (2020) lays out some of the problems with this technology, showing that it requires specific spatial and environmental conditions to detect fever, which severely limits their utility. Greenwood references industry sources which state that the cameras should be no more than 1.6 m away from the observed object to ensure consistent temperature measurements. However, in several countries, flying drones this close to and over groups of people is already prohibited by existing regulations (for example EASA, 2020a, 2020b). Further, the thermal reading may be negatively affected by factors that are hard to control outdoors, such as camera stabilization, wind, and outdoor temperature (Greenwood, 2020). While using drones for scanning temperature can address one key issue related to the pandemic, this is true only as long as people have such symptoms – yet a large number of infected persons do not have symptoms. Fever detection through computer vision also has severe drawbacks, the main one being that this technology is still very much at a developmental phase (Khanam et al., 2019; WE Robotics, 2020).

Besides, the privacy issues raised by the proliferation of drones have started to be discussed in the courts and in regulatory authorities. In France, the Conseil d'Etat ruled that drones equipped with cameras as employed by the police can no longer be used to monitor public compliance with the pandemic mitigation efforts (Fouquet and Sebag, 2020). The legal battle was initiated on grounds of privacy, such as people being filmed without their knowledge and consent, and the lack of restrictions on how long footage could be kept. The Portuguese data protection authority has also been raising similar issues. In Belgium, the college of public prosecutors did not allow the use of drones by the police to monitor potential violations of the COVID-19 measures as they evaluated this use 'disproportionate' while drones 'can still be used to assess a general situation, such as the crowds in a busy shopping street or along the seafront' (Chini, 2020). Likewise, and for a brief period, the police department in Westport, Connecticut intended to apply this technology as part of its strategy to counter the pandemic (Burke, 2020), but had to denounce the plan after being met with privacy concerns and condemnation from the American Civil Liberties Union of Connecticut (Blair, 2020).

### **Learning from drones: the societal implications of techno-solutionism**

We will now proceed to analyse the empirical data through the conceptual framework advanced before to show how drone use during the pandemic shed light on the broader societal implications of techno-solutionism in liberal democracies. We follow Mudde and Kaltwasser (2012, p. 13) in understanding liberal democracy as 'a system characterized not only by free and fair elections, popular sovereignty, and majority rule, but also by the constitutional protection of minority rights'. As previously mentioned, while the drone use has been a reality across the globe, some of the issues we will discuss are placed within the limits of liberal democracies, where contestation, public acceptance, regulation,

and surveillance, for example, have different manifestations than in non-democratic regimes.

As the previous section reveals, the increasing use of drones by the national authorities during the COVID-19 pandemic has generated a new socio-technical assemblage of actors, technologies and practices. Hence, we organize our analysis here around the following key effects of this socio-technical assemblage: acceleration of regulatory processes, public acceptance, new safety issues, surveillance assemblages, and the normalization of exceptionalism.

### The acceleration of regulatory processes

The recent functional expansion in the use of drones impacts current and upcoming implementation of new regulatory frameworks that aim at integrating them in the civilian airspace. Discussions to elaborate new regulatory frameworks necessarily engage a broad range of public and private actors with different interests and expectations which, in turn, impact the policy process, as we have seen over the last few years for example in the US (Hall and Coyne, 2014), within the EU (Csernatori and Lavallée, 2020; Lavallée, 2019), and Latin America (Sandvik and Martins, 2018), among many other regions (Masutti and Tomasello, 2018). There are different kinds of drone users (public, private, individual, collective), just as there is a broad range of applications. During the first months of the COVID pandemic, the rules for circulation in civilian airspace have been alleviated in some regions or countries and their integration facilitated or even hastened by the respective regulatory authorities, mainly for drone use by state authorities. The Italian Civil Aviation Authority, for example, approved a time-limited authorization for local police to use drones to monitor the movements of citizens during the pandemic. Similar exceptions were made in Portugal during the first declared state of emergency in April and May 2020. Further examples exist from around the world. As explained by Calhoun (2010) in a humanitarian context, fast-track decision making is a dynamic typical of an emergency situation.

Since the beginning of the outbreak, interest groups made of manufacturers and/or drone users have exerted pressure for fast-track re-regulation. In May 2020, for example, the Small UAV Coalition, a US drone industry association, sent a letter to the US Secretary of Transportation and the FAA Administrator to reiterate a request for the authorities to 'waive the prohibition on commercial UAS package delivery operations beyond the visual line of sight' (Small UAV Coalition, 2020, p. 2). This case illustrates how different actors engage with the regulatory process in different ways. In concrete, we now observe technology developers both providing input to the state-led regulatory process and creating the conditions of possibility for the emergence of new (social) norms that may in turn further challenge existing (state) regulation, as explained by Hildebrandt (2016). This logic has been thoroughly demonstrated during the COVID-19 pandemic, a time in which we witness an overwhelming digitalization of society, in both professional and personal settings. The 'smart environment' described by Hildebrandt

is more of a reality than ever, as COVID-19 emerges as the first pandemic in digital times.

### Public acceptance

In the very few focus groups and surveys on public acceptance of drones that have been undertaken so far in Europe and North America (Aydin, 2019; Boucher, 2016; Thompson and Bracken-Roche, 2015; West et al., 2019), the 'full skies vision' or crowded airspace has often provoked rather negative feelings that come along with surveillance, criminality, terrorism and nuisance. Yet, can the use of drones during the pandemic to perform clearly positive tasks (such as delivering medicine or supplies; see Sandvik and Jumbert, 2016) alter this perception? While the image of drones in the civilian airspace was once the sky of the future, the pandemic is contributing to make it a present reality, providing a hint about what is to come in the 'drone age'.

Ever since discussions over drone regulation began, one key question has remained open to the drone industry and to some policy entrepreneurs: how should we prepare the general public for the integration of drones into their daily life? Some manufacturers insisted that, with time, people would see their benefits and buy them. As Monsees (2019) argued, for national authorities to solve the issue of public acceptance of technology integration, it is important not only to inform and prepare the public, but also to engage citizens for the sake of democratic processes. With the acceleration of some drone integration processes due to the pandemic, what could have taken years for dialogue, awareness raising, and public consultation to achieve in addressing public fears and various perceptions surrounding drones has been short-cut. Whereas it is still too early to assess any change in the public perception of drones, especially by the non-users, we observe that the recent drone use by national authorities has largely taken place without widespread contestation, unlike the public criticism we have seen towards contact tracing apps, which itself has led local and national governments to revert or revise decisions on these apps. It is also understandable that a public overburdened with health, social and economic anxieties has a limited capacity to mobilise socially. Additionally, and contrary to tracing apps, most governments did not make information and consultation campaigns to promote the need for using drones, which in itself raises problems and impact public acceptance and/or contestation.

Studies on public acceptance have shown that an acceptable development path should include safeguards against 'function creep', whereby the authorities begin to use drones to address certain problems, with the risk that they gradually extend their role towards day-to-day policing tasks and eventually (mass) surveillance (Boucher, 2016; Thompson and Bracken-Roche, 2015). The passive public acceptance of further technology integration should not be admitted as an alternative to active communication and education by authorities, as well as to clear regulatory frameworks. Liberal democracies should engage with their citizens about what drone integration means and make sure legal norms are there, because a socially responsible

technology regulation is a matter of responsibility, accountability and legitimacy, as Hildebrandt (2016) assessed. An acceptance of drone integration by default might lead to a later rejection, which in the long run may impact the wider integration process and all the previous regulatory work done for ensuring a smooth integration.

### Safety issues and counter-drone technology

As the use of drones in some urban areas increased during the pandemic, so did safety and security issues associated with it. As seen in the case of disinfecting drones, technology employed to solve one particular issue may create an entirely new problem. The potential proliferation of drones in the civilian airspace increases the likelihood of accidents due to failure of technology, through collisions in the airspace, or by breakdown in the delivery of cargo, for example. It also facilitates criminal activity which can take place in many forms, such as by hacking drones used by law enforcement or health authorities, by using drones to deliver contraband amidst a drone-populated airspace, and by using drones to conduct some sort of attack, politically motivated or not.

As of today, these security and safety issues cannot be fully resolved by existing technological solutions, in particular counter-drone technology (C-UAS). Counter-drone systems are 'technologies that are designed to detect, track, identify and/or intercept unmanned aircraft, particularly those small unmanned systems that cannot be countered with traditional anti-aircraft systems designed for use against manned aircraft' (Martins et al. 2020a). C-UAS technology is often not fully effective, and those wishing to use the technology face a range of hurdles with respect to legality, coordination, planning, and safety (Michel, 2019). Current legal frameworks are lagging behind technological developments, and therefore many of the available C-UAS technologies cannot be used in civilian settings due to legal restrictions. It can be expected that, if drones populate the airspace, these challenges will grow.

When making decisions about counter-drone technology, government officials, law enforcement agencies, and other security professionals look mostly for two criteria: efficiency and cost. The broader societal aspects are widely disregarded, including by most tech developers. C-UAS technology is a surveillance system, which raises privacy concerns and can lead to psychological stress and to elevation of threat perception. It is part of a growing militarization of law enforcement and often takes civilian-military entanglements a step further.

The use of drones by national authorities during the COVID-19 pandemic illustrates how rushed technology integration in times of exception can create serious safety and security issues, and how counter-measures are not always available or suitable.

### Surveillance assemblages

As mentioned in the introduction, technologies such as precision location trackers and high-resolution smart cameras

(including thermal cameras) have been coupled to drones to perform specific tasks and generate data for specific purposes, for example to identify the dispersion of the contagion in a crowd, to monitor borders, and to track the movement of people. This contributes to new surveillance assemblages, where data of different nature – geolocation, health records, biometrics – is mobilized and crossed in order to fight the pandemic (see for example Roberts and Elbe, 2016). The use of drones for temperature detection, for example, illustrates how different data is mobilized and how surveillance is multidimensional. Such assemblages are facilitated under 'states of emergency' and exceptional rule, raise several ethical and legal concerns on data protection and privacy rights, and generate the creation of the 'data doubles' that Bigo (2014) and Haggerty and Ericson (2000) have addressed.

As explained by Haggerty and Ericson (2000), Lyon (2018) and others, contemporary surveillance dynamics have moved away from the Orwellian, '1984', panopticon scenario of state surveillance; today, the culture of surveillance requires the direct participation of those being surveilled. As previously mentioned, this participation happens on a spectrum, from open and voluntary participation to full ignorance, and the post-pandemic scenario will show where in the spectrum we and our societies will be placed. The use of contact tracing apps, for example, the use of which is often voluntary, illustrates that many citizens are willing to provide public authorities and private companies with personal data that may be used for this specific goal, therefore participating in the contemporary culture of surveillance (Lyon, 2018). Here as well the combination of the techno-solutionism logic with the exceptional character of this global pandemic make this new socio-technical assemblage of actors, technologies and practices harder to contest.

### Technology integration and the normalization of exceptionalism

All over the world, states have responded to the challenges of the COVID-19 pandemic by invoking the state of emergency – generally characterized by an expansion of state power, allowing it to perform actions that it could not carry out in times of normal politics. The issue of normalization of exceptionalism is, as argued by Neal (2012), not one of binary distinction between normal times and exceptional times. In his words, we 'need a more complex understanding of the unfolding relationship between the two', namely, to understand how the political and legal processes entailed by exceptions and emergency powers play out over time and blur that distinction (Neal, 2012, p. 261–262). The temporary permit for an expanded use of drones by law enforcement agencies on the grounds of COVID-triggered states of emergency across Europe and beyond illustrates precisely the problems associated with 'the exception': in several countries the state of emergency has lasted for many months and remained in place more than a year after the beginning of the pandemic. As societies grow increasingly reliant on new technology to tackle new issues, this techno-solutionism may serve to normalize the exceptional security measures and new practices

adopted under emergency. In this context, then, technology mediates and may facilitate the implementation of exceptional security measures.

## Conclusion

Social distance emerged as one of the most disruptive features of the COVID-19 pandemic, and, with it, myriad problems were created. Aiming at filling some of the gaps generated by physical separation, drones promised solutions and fixes to some of those problems. The overview provided in this article suggests that we are witnessing a functional expansion in the use of drones, and this usage may impact society in several analytically-relevant ways in the long run. These include acceleration of regulatory processes, function adaptation, public acceptance, new safety issues, surveillance assemblages, and the potential for post-pandemic normalization of exceptionalism.

The article has argued that the prevalence of techno-solutionism as an ideology of public policy, materialized in the extensive use of drones by the national authorities during the COVID-19 pandemic, has generated a new socio-technical assemblage of actors, technologies and practices. This, in turn, has created relevant societal effects that are nevertheless hard to contest. This is explained by the combination of the techno-solutionism logic with the exceptional character of this global pandemic.

The central role played by public health authorities, experts and technocrats, as shown in the management of the pandemic, confirmed a new trend towards technocracy or expert governance. For Saint-Martin (2020), this indicates that we are living in a 'technocratic moment' where 'new' political power is progressively relying on/shifting to the legitimacy of experts' knowledge to make decisions in a time of crisis (see also Danaher, 2016). For some, in the context of increasing use of technology, 'a dominant technocratic logic is said to sidestep or even erase core political questions about values and interests and replace them with references to security technologies as the "objectively" best solutions' (Monsees, 2019, p. 532), with drones being an illustrative case of this, potentially reinforced by the general lack of contestation that their recent use has triggered.

This technology integration is of course a differentiated phenomenon across the world. Drones have been used in several countries, but not necessarily everywhere and not in the same way by the same actors. As a consequence, the impact of this drone use on public perception and its effects on society also differ from one place to another. However, as this article argues, the increasing trend among national authorities worldwide for using drones to address the COVID-19 pandemic issues has generated a new configuration of actors, technologies and practices which impact our societies in many ways.

Countering dominant discourses about technological benefits is important because, as explained by Winner (1983) and summarized by Stilgoe (2020, p. 11), technology 'constrains and enables our choices in much the same way as laws do, but the process of debate and scrutiny that exist to shape our

laws is largely absent when it comes to technology'. As new technologies become more advanced, the epistemic gap between technology developers, on the one hand, and technology users and regulators, on the other hand, widens, bringing along societal implications that are increasingly unnoticed. All these dynamics have been observed during the COVID-19 pandemic, and it is our objective to help preventing that we sleepwalk into our technological futures (Winner, 1983), finding ourselves in a new normal as the general perception of emergency slowly vanishes, and we observe the digital footprint it leaves in our societies.

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## Note

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