Monika Arnez[1]

Digital transformation and drone technology in Indonesia - Envisioning the smart farm[2]

Indonesia, an archipelago comprising over 17,000 islands and a population of 281 million, has undergone rapid digital development in recent years. It is marked by a flourishing digital economy valued at US$82 billion, the most robust in Southeast Asia (Antara 2023). However, to sustain this growth, the country anticipates a demand for approximately 9 million skilled digital workers by 2030, presenting a significant challenge due to low digital literacy and inequitable access to technology (The SMERU Research Institute, Digital Pathways and UNESCAP 2022, 1-2; Sapulette and Muchtar 2023, 2).

The 2045 Digital Indonesia Vision (VID) and its Challenges

The Communication and Informatics Ministry released Indonesia's 2045 Digital Indonesia Vision in 2023. Among its aims are to provide high-quality, fast connectivity and ensure data sovereignty and data protection.

The new capital Nusantara, which is currently built on Kalimantan, is an important element of this vision. This city should solve all the problems better than the current capital, which is sinking and had the dirtiest air in the world in 2023 according to data provided by IQAir, a Swiss air quality technology company (Chen 2023).
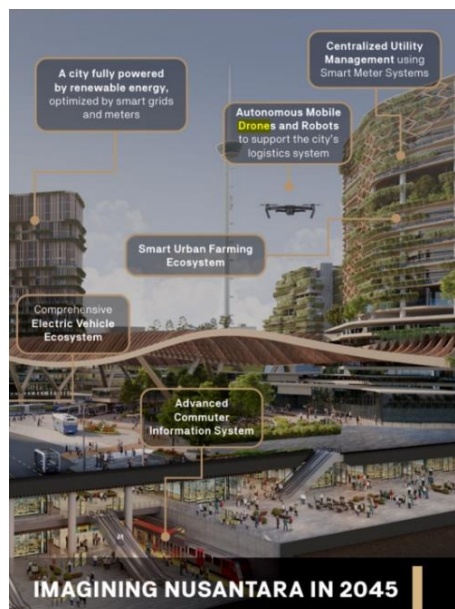

Fig. 1. Imagining Nusantara in 2045

Source: https://www.ikn.go.id/storage/produk-ikn/nusantara-vlr-baseline/nusantara-vlr-baseline-en.pdf

Nusantara is envisioned as a smart, clean city using cutting-edge technology

and renewable energy to facilitate an amiable life for its citizens.

However, there are some contentious issues regarding the VID and its implementation, as recent research has shown.

Drone technology: benefits and drawbacks

As shown in Fig. 1, drones, also known as Unmanned Aerial Vehicles (UAV), are a firm part of the imaginary of the new smart capital; they are illustrated as a flexible transport option.

Drones are seen as a technology that will generate jobs in the future, in urban areas and the countryside alike. For example, the profession of a drone operator was identified among the top five jobs in demand for 2020 (Al-Qodariah 2019). The drone count in Indonesia surged from 6,500 in 2018 to 17,200 in 2024,

with projections reaching 22,500 units by 2028 (Statista 2024).

The drone market is predicted to have a promising future. "Indonesia's Drone market is anticipated to grow at a compound annual growth rate (CAGR) of 6.30% over the forecast period to reach US$11.798 million by 2029, increasing from US$7.694 million in 2022" (Knowledge Sourcing Intelligence 2024).

One reason for this anticipated growth is the versatility of drones that allows for different uses. Among the areas of application for drones in Indonesia are border protection and surveillance as part of investments in military infrastructure, measuring territories, filming from a bird's eye view and facilitating the digital farm. Yet, due to the different technological affordances of drones, in other words, the possibilities of their use, the prices for drones also greatly vary. While drones equipped with cameras for filming may be deemed affordable for many, drones for farm use are far more expensive.

Drones, as a disruptive technology, are only as good as the intention of their users. They can be employed to destroy lives, as they have been used in the war in Ukraine and Palestine as well, or to save lives. The double-edged nature of drones also reveals in migration, where drones have been used to save lives in the Mediterranean Sea but also to push migrants and refugees back into unsafe territories.[3]

Their ability to collect large amounts of data with different types of sensors, for example, to identify heat signatures (passive infrared sensors and thermal cameras) or map territories with LiDAR technology, is both attractive for many

actors and a challenge. Ethical questions arise as to who analyses this data, who has access to it and who passes it on to whom. This is not transparent in many cases.

Envisioning the smart farm

In this section, I have incorporated the results of how drones are portrayed in Indonesian media and on the websites of selected companies as part of my research project, which I conducted using the qualitative software programme MAXQDA, with a focus on agriculture.

Unsurprisingly, given the fact that the media in Indonesia are dominated by a few influential players linked to politics and business (Syarief 2022), drones are represented in a positive way in the sources I have examined, not only in terms of farming but also in other contexts such as surveillance.

Drones are part of the capitalist system that leverages their materiality for the interests of the developmentalist state. Institutions with financial resources, whether public or private, are trying to use drones to increase efficiency and extend the arm of government. Drones can implement government plans in a wide range of areas, from monitoring the borders to Papua to increasing efficiency on plantations.

Against the backdrop of an aspirational modernist nation firmly anchored in the belief in progress through technology, the Indonesian government is shown to strongly support the use of drones. Reports indicate that the Ministry of State-Owned Enterprises (BUMN) has encouraged the use of drone technology to spray fertiliser on agriculture, pointing out that this process only needs 10 minutes for one hectare instead of five to seven days if done manually (Farhan and Ika 2021).

Financial institutions such as Bank Indonesia are reported to have started supporting the provision of drone technology to benefit various stakeholders in the agricultural sector as part of their corporate social responsibility efforts. The idea was to borrow drones equipped with functions to spray fertilizer more efficiently so that farmers can increase the productivity of their agricultural produce (Suprianto 2024).

In the examined sources, farmers are revealed as eager to apply the new technology. For example, one farmer was referred to as being flexible in finding a solution for the high costs: "I want (agricultural drones), if the price is 20-30 million, I can buy them. But if you calculate it again, it's better to rent it for only Rp.160,000 for one hectare," he said during a fertiliser spraying activity in Sumber Village, Bandung Regency (Permadi and Ika 2021).

One topic that is being discussed in the media in terms of the smart farm is the age of farmers. There are fears that farming is being done too much by ageing farmers and that young people are not interested enough. As recent research has indicated, the media tend to represent declining youth participation in agriculture "as a lack of individual initiative and frame solutions almost entirely in terms of new technology and entrepreneurship" (Toumbourou et al. 2023).

On Drone Sensors and Data

Among the companies operating in Indonesia with a focus on agricultural drones are Terra Drone Indonesia, the Indonesian subsidiary of the Japanese company Terra Drone, the Indonesian startup Beehive Drones and Huida Tech, a Chinese agricultural drone manufacturer with a strong presence in Indonesia.

They advertise drone technology as an integral part of precision agriculture. Albertus Gian Dessayes Adriano, the founder of Beehive Drones, for example, pointed out the following: "Drones for agriculture represent one of the approaches of so-called precision farming, a management strategy that aims to optimise agricultural yields through sophisticated monitoring tools. Ground sensors, remote sensing equipment and GPS systems make it possible to assess the state of the soil and adopt the most effective cultivation techniques" (Gaglione 2020).

The data collected with the sensors, processed with algorithms, are an important tool to increase productivity on farms, reduce human labour and use resources more sparingly. By analysing the data collected about a territory it is possible to make statements about its nature, including its soil quality, water permeability, and the corresponding needs in terms of pesticides and fertilizers. Anyone who has access to this data can make fairly accurate predictions about future requirements - this can create dependencies between those knowing the demands and those in need of the resources.
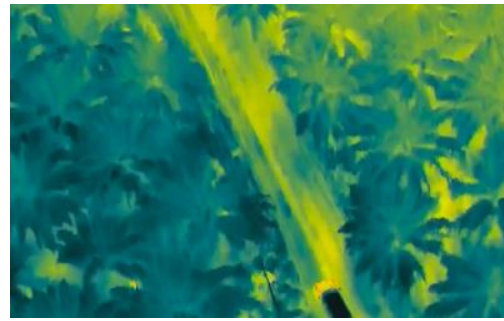

Fig. 2: Footage of a plantation, captured with a drone equipped with a thermal camera. Source: Business Surveillance - Agriculture Drone Services Company (terra-droneagri.com)

Thermal cameras are reported as a means of agricultural surveillance. Terra Drone Agri, for example, write on their website that when people or cars move across palm oil plantations at night, for example, the thermal camera can capture this, including at night. They thus make a case for this technology providing more security for farmers.

Conclusion

Drones are a double-edged sword; depending on the intention of their users they can be employed for better or for worse.

What seems to be absent in Indonesian media is a critical discussion of drones and its use in farming. As previously stated, drones are versatile, manoeuvrable and can be invisible at night, depending on the type of technology used, but that is precisely why they are also prone to abuse.

Questions that are not discussed are, for example, issues relating to data usage rights. Who owns the data, how is it used, how is it stored? Can the respective manufacturer use the data collected by the drone without hindrance, even if the manufacturer is located abroad? What happens when drones need

maintenance or are faulty and cause damage due to crashes? These are important questions to be discussed in public.

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[1] Monika Arnez is an Associate Professor for Asian Anthropology at Palacký University Olomouc. She was a Visiting Senior Research Fellow at the Department of Contemporary History at the University of Graz from February 2024 to May 2024, hosted by Prof. Christiane Berth.

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[3] See video essay: "Droning Borders" (Arnez 2024): Droning Borders (youtube.com). I gave a talk about this topic on occasion of the COST action History and Identity Documentation in European Nations (HIDDEN) on 25 June 2024 in Brussels.