Atmospheric Zomia:
Revisiting Upland Southeast Asia under Anthropocene Conditions

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This engagement revisits Willem van Schendel's (2002) and James C. Scott's (2009) depiction of Zomia under Anthropocene conditions. Zomia is a vast area of 2.5 million square kilometers, where approximately 100 million minority people lives. Historically, these ethnic groups have relied on altitude and the friction of the terrain to escape the authority of modern states and remain ungoverned. Since the late nineteenth century, however, the area has increasingly been enclosed by these states, which has led to greater control of the populace through different kinds of economic policies and biopolitical apparatuses.

With reference to recent concerns with uncontrollable upland burning, massively extractive plantations, and regionwide material itineraries (Jensen 2021; Sangkhamanee 2021) of smog over the northern Thai provinces,[1] I offer a perspective on one remote part of Southeast Asia, which considers it as a critical zone where many entanglements together redefine the ontological composition and cross-boundary effects of the area. This Anthropocene anarchism does not quite match Scott's (2009: 7) Zomian image of human-centered ungovernability of ethnic groups and state inability to govern such 'shatter zones.' Rather, as a consequence of Plantationocene (Barua, Martín, and Achtnich 2023; Chao 2022a) and Capitalocene (Haraway 2015, Moore 2016, 2017) entanglements, fine dust particles embark on material itineraries that transform the area and produce effects from the plantations and all the way back to the state-centers. In this manner, atmospheric Zomia traces new ecological lines between state territoriality, capitalism, and life on the fringes of Southeast Asia (Cassaniti 2021).

What is Zomia?

Zomia denotes elevated regions in Southeast Asia renowned for their rugged landscapes, historical seclusion, and resistance to state authority. This geographic area spans several Southeast Asian nations, including China, Myanmar, Thailand, Laos, Vietnam, and Cambodia. Shared historical and cultural characteristics within the highlands have fostered enduring opposition to centralized assimilation. The term was originally coined by the historian and anthropologist Willem van Schendel (2002) in the article "Geographies of Knowing, Geographies of Ignorance: Jumping Scale in Southeast Asia" to designate the highland massif of mainland Southeast Asia, which has traditionally eluded government control. Subsequently, the political anthropologist James C. Scott (2009) popularized the term in *The Art of Not Being Governed: An Anarchist History of Upland Southeast Asia*," which challenged conventional notions of

[1] PM 2.5 refers to particulate matter that is 2.5 micrometers in diameter or smaller. They are a significant concern in the context of air pollution due to their ability to penetrate deep into the lungs and even enter the bloodstream.

statehood, civilization, and development in the region. In the hands of Scott, Zomia was reoriented towards the anarchic cultural and political dynamics of these remote highland areas.

These areas were traditionally associated with practices like swidden or shifting cultivation. In Scott's term, they "knitted together as a region not by political unity, which it utterly lack, but by comparable patterns of diverse hill agriculture, dispersal and mobility, and rough egalitarianism" (2009: 19). According to Scott, however, as states in the region expanded territorially in the second half of the 20th century, Zomia was gradually encircled. Eventually, it became Earth's "last enclosure" – though admittedly a huge one. In this engagement, I will argue that these once-autonomous regions are experiencing a significant 21st century resurgence. Rather than by dominant state-projects, it is driven by intense agricultural practices instigated and propelled by capitalist forces, which currently exert the greatest influence in the region. I also contend that the transformed ontological composition of this region is not only determined agricultural practices on the ground, as in the traditional Zomian formulations, but, just as importantly, by the atmospheric intensities of fine dust particles.

Atmospheric Zomia: Under a Fine Dust Regime

To challenge conventional perspectives on what constitutes the area, and to reveal a complex interplay of factors within the Anthropocene epoch, I refer to *atmospheric Zomia*. What sets Atmospheric Zomia apart is a unique constellation of world-shaping forces captured with two overlapping and competing terms: Capitalocene and Plantationocene. Both are extensions of, and challenges to, the Anthropocene, which encapsulate the profound impact of human activities on the environment. In Zomia, they are connected in a particular manner with wide-ranging effects.

As suggested by the first term, promoted by Malm and Hornborg (2014) and Moore (2015), the Capitalocene highlights the dominant world-shaping role of capitalism in destroying the planet. This concept is very pertinent for grappling with ongoing events in upland Southeast Asia. Since the late 2000s, this area has seen an extensive expansion of corn plantations, driven by the pursuit of global profit on the global stage. As a conceptual framework and challenge to the Anthropocene, the Capitalocene underscores emphasizing the dominance of capital in our economic and environmental systems and its central, destructive role in shaping the planet. In atmospheric Zomia, the Capitalocene manifests through intensive agricultural practices in the upland areas. Here, vast and intensive plantations cultivate crops for international markets like corn, rice, and sugarcane. In pursuit of profit, these agribusinesses employ methods of land burning that dramatically transform landscapes and have transformative effects for the entire area and far beyond.

This brings us to the Plantationocene, a term that emphasizes the profound influence of large-scale monoculture plantations on ecosystems. These agricultural methods require recurrent burning of extensive land areas to create space for new crops, and from such burning emerges *atmospheric Zomia*.

The burning of large tracts of land releases fine dust particles into the atmosphere. Because these particles can traverse vast distances carried by the wind, they affect not only the local environment but also neighboring regions (Vongruang and Pimonsree 2020). By transcending geographical borders and creating an intricate web of ecological consequences, fine dust particles are becoming defining features of Atmospheric Zomia. The fine dust regime poses considerable health risks to the residents in the area, as well as to other regions subject to drift (Chen and Taylor 2018). There are economic ramifications for agriculture, transportation, and tourism.

Atmospheric Zomia, therefore, is not merely about geographical boundaries: it's an evolving landscape shaped by the interplay of capitalism, the materiality of intensive agriculture, and the mobility of fine dust. Emerging from practices of burning, the fine dust regime creates Anthropocene effects, which in turn underscore the intricate relationship between human activities, political geography, and the environment.

As we grapple with Anthropocene challenges, the emergence of atmospheric Zomia provides a distinctive perspective on the complex dynamics between people and the areas and ecosystems they inhabit and use. It also calls for a rethinking of our approach to area study to include feral and nonhuman agency in defining the territories of entanglement in the construction of a non-fixed area.

The Zomian Plantation- and Capitalocene: An Economic Driver in Upland Intensive Agriculture

The heart of the atmospheric Zomian transformation is in the rapid expansion of intensive agriculture, particularly the cultivation of crops such as corn and other commodities (Chao 2022, Hetherington 2020). As this shift has been driven by economic incentives and the pursuit of profit, it encapsulates the Capitalocene.

The primary or dominant crop of the upland plantations of mainland Southeast Asia is corn. Corn is significant for the emergence of the fine dust regime because it involves practices of field burning as part of the production process. To clear land for the next planting season the fields are set ablaze. This is essential to prepare the soil for new crops, but it has wide-ranging ecological consequences.

In traditional Zomia, smallholder farmers practiced shifting cultivation, a method where patches of land where cleared, crops were cultivated for a few years, after which there would be a move to a new area, which allowed the exhausted land to revert to forest or natural vegetation. While preserving biodiversity and traditional knowledge, shifting cultivation has its own drawbacks, including soil degradation and deforestation. Today, however, increasing demands for corn have led to dramatic changes in land use patterns and agricultural intensification. Farmers burn the fields right after cultivation to clear land for the next round of production. These practices have turned the region into one of the largest sources of biomass-burning emissions in the world (Street et al. 2003).

Recent data underscores the extent of the Capitolocene's influence on the upland regions. In 2020, the area of corn plantations in mainland Southeast Asia reached over 1.5 million hectares, contributing significantly to the global corn market. Furthermore, the income generated from this agricultural practice is substantial, revealing the economic motivation behind the corn boom.

Hot Spots: Governing the Ungovernable Fine Dust

In the highland areas of Thailand, Laos, Vietnam, Myanmar, and southern Yunnan of China, so-called “slash-and-burn” agriculture is not limited to corn. Among other crops treated in a similar manner are rice and sugarcane. According to recent statistics (Greenpeace 2021), Thailand burned approximately 13.8 million acres, of which 7.9 million acres were attributed to rice cultivation, accounting for 58% of the total. In addition, an estimated 1 million acres of sugarcane, accounting for 9%, are also burned. Corn represented 5%, or 0.7 million acres. But in fact, when it comes to corn cultivation, the Ministry of Agriculture and Cooperatives (MoAC) and the Ministry of Natural Resources and Environment (MoNRE) define and allocate different areas. MoAC reports only on corn fields that are cultivated outside forest areas, yet forested areas with reported burning, including of corn fields, account for nearly 10 million acres. This means that there are no exact numbers for burning in corn fields within the forests. This is especially problematic because a study on hotspots in northern Thailand and neighboring countries conducted between 2019-2023, found that 80-90% of hotspots originated within protected forest areas. Those areas include national parks and wildlife sanctuaries, rather than legally designated agricultural areas. Looking back at the period from 2010 to 2022, approximately 9.7 million acres were repeatedly burned, with 65% from “forest” fires, 22% from rice fields, 6% from corn fields, and 2% from sugarcane fields (TIJ 2023).

The Geo-Informatics and Space Technology Development Agency (GISTDA, 2022), which monitors and verifies burning incidents, or hotspots, in open areas by using TERRA and AQUA MODIS satellite systems, identified a total of 6,239 hotspots from January 1 to May 31, 2023. They were distributed as follows: 1,915 in agricultural areas, 940 in protected areas, 926 in conservation forests, 1,572 in national park areas, 151 in roadside areas, and 735 in community and other areas. Most hotspots were concentrated in the northeastern region (1,976 hotspots), the upper northern region (1,907 hotspots), and the lower northern region (868 hotspots). But if we look at the regional level of ignition, the number is far larger than the national one. According to Nyugen Ngoc Linh Thao et al. (2022), more than 100,000 regional fire hot spots were recorded every March between 2011 and 2021, with a peak of 120,140 hotspots in 2012. Obviously, this has significant implications for the emergence of the fine dust regime.

In the northern region of Thailand, there are local government initiatives which seek to regulate the "volumetric territoriality" (Goldstein 2019) of atmospheric Zomia. One of the measures is to implement the FireD (or “good fires”) system, which categorizes upland fires into various types (Vaddhanaphuti 2023). FireD is a decision support system that aggregates real-time weather and pollution data with the current count of fire spots. The data obtained is used to support command center committees or district level administrators tasked with authorizing or

prohibiting burning operations. According to the system, there are three categories of fire: natural ones, which transpire beyond human influence; open burning fires, which are sanctioned by the committee of the command center; and illegal burning fires, which are not registered or are difficult to verify. Vaddhanaphuti (2023) argues that the system fails to consider biophysical, managerial, and technological uncertainties, in addition to the political dimensions of local burning practices. This has led to disruptions of the prescribed burning schedule and resulted in unfair treatment for those who, despite a lack of technological expertise and knowledge, rely on fire for their economic survival. The FireD system is also limited and ineffective, both epistemologically and practically, in terms of resolving broader regional and transboundary issues of wildfires and haze.

The Fine Dust Regime

Fine dust, or particulate matter 2.5, is a mixture of tiny solid particles and liquid droplets suspended in the air. The fine dust particle that are released through agricultural burnings create an interconnected network of ecological consequences (Amnuaylojaroen and Parasin 2023). In particular, the adverse impact on air quality and public health is significant. According to the World Health Organization (WHO), fine dust pollution is linked to respiratory and cardiovascular diseases and poses health risks for millions in the region (WHO 2022).

According to the Greenpeace (2020), during 2020, the distribution pattern of PM2.5 dust with concentrations exceeding the monthly average as recommended by the World Health Organization (more than 25 μg/m3) covered a total area of 44.5 million acres in the Mekong Subregion. The largest distribution covers the northern part of Lao PDR—22 million acres—followed by the upper northern region of Thailand, 15.5 million acers, and the Shan State of Myanmar, 6.8 million acres.

The economic consequences are equally profound. For while fine dust can disrupt health and overall well-being it also affects transportation by reducing visibility and increasing the risk of accidents. Tourism, a vital sector in many upland regions, is affected as travelers are deterred by poor air quality and the dangers of driving.

Open-field burning, and the resulting PM 2.5 air pollution, is a significant problem across South- and Southeast Asian regions. This level of air pollution can reduce life expectancy by 2 to 4 years. In the eyes of local people not heavily involved with agriculture, regional governments need to urgently address the dust regime, for example by incentivizing livelihood alternatives that will make it appealing or at least tolerable to farmers to reduce or stop burning (Faulder 2023) for example through changing agricultural practices. As things look presently, though, it is probably quite challenging to introduce equipment or technology as an alternative to burning for farmers in the highland areas of Laos and the northern regions of Myanmar.

Farmers know that burning is not a good practice, but with few alternatives or motivations for behavioral change, they carry on with the same old practices. And it is difficult to blame them. After all, Capitalocene and Plantationocene effects are not determined by local agro-industrial

plantations, harmful as they are, but emerge from extended entanglements in a larger—or longer—regime of transnational production and multi-national corporations. One way or another, it will therefore be crucial to involve the private sector. Although comprehensive regulation will be very difficult, it is also crucial that regional governments create effective frameworks for mitigating the fine dust regime spreading from atmospheric Zomia.

Conclusion

To recap, then, Atmospheric Zomia, shaped by co-implicated Capitalocene and Plantationocene practices, presents a novel and highly interconnected ecological challenge. The extensive expansion of plantations, coupled with the burning of land, has created a fine dust regime that transcends geographical borders.

By following material itineraries and flows of capital, as well as the cultivation of plantations supported by transnational corporations, this engagement has shown how environmental issues arising from such production processes. The fine dust regime creates a new version of Zomia and generates transboundary haze pollution. In an important sense, twenty-first century Zomia is thus an atmospheric area, which emerges from Capitalocene and Plantationocene entanglements, and generate new Anthropocene problems and effects.

When James Scott mournfully described Zomia as “the last enclosure,” he evidently thought the area was on the verge of extinction, certainly in its terms of its ungovernability. Since World War II, state authority has indeed expanded continuously, and the hill populations are now subject to many forms of management and biopolitical control. But at the same time, a new Zomia has come into being, geographically overlaid on the previous one, though not seamlessly, in consequence of the movements of fine dust particles. In this resurgent form, new Zomia does not conform to Scott’s ontology of state evasion, shifting cultivation, and egalitarianism. Instead, this is a Zomia where the state lacks the ability to control and manage the outcomes of land management processes, for reasons that are closely tied to the mechanisms of capitalist production and commercial cultivation in highland areas. The new Zomia exhibits a heightened intensity of plantation-based production at the ground, leading to widespread and dispersed post-harvest burning, and ultimately giving shape to an atmospheric region defined by the presence of fire and fine dust suspended in the air.

Statelessness is still a significant dimension of atmospheric Zomia, but not in the conventional sense of lacking political authority to govern the region. Instead, the absence of state power is elicited as the inability to deploy advanced surveillance technology and regulate uncontrollable plantation burning, which is primarily driven by the intense demands of capitalism-fueled production. The capacity of the state to "bring nonstate space and people to heel" (Scott (2009: 4) is presently severely challenge by the entwined dynamics of Plantationocene and Capitalocene processes. Thus, whereas the original Zomia existed as a fringe area where state effects could barely reach, where individuals and communities seeking to elude control formed

and inhabited “shatter zones,” atmospheric Zomia emerges as an Anthropocene effect which returns with the winds to pollute other areas, including even the state centers.

As we grapple with such unforeseen consequences, Atmospheric Zomia clearly calls for a reevaluation of areas as *entangled* via material itineraries. With this realization, too, comes the commitment to learning how to mitigate the adverse consequences of these entanglements. Atmospheric Zomia is thus a testament to the complex relationship between human activity and the environment. How we learn to address it from area perspective will shape the future of this part of the world.

References

Amnuaylojaroen, Teerachai, and Nichapa Parasin. (2023). “Perspective on Particulate Matter: From Biomass Burning to the Health Crisis in Mainland Southeast Asia” *Toxics* 11(7): 553.

Barua, Maan, Rebeca Ibáñez Martín, and Marthe Achtnich. (2023). “Plantationocene.” Theorizing the Contemporary, *Fieldsights*, January 24.

Cassaniti, Julia. 2021. “Up in Smoke: Cosmopolitical Ecologies and the Disappearing Spirits of The Land in Thailand’s Agricultural Air Pollution” In *Cosmopolitical Ecologies Across Asia: Places of Power in Changing Environments.* Riam Kuyakanon, Hildegard Diemberger, and David Sneath, eds. Routledge. 62-80.

Chao, Sophie. (2022a). “(Un)Worlding the Plantationocene: Extraction, Extinction, Emergence.” *eTropic* 21(1): 165–191.

Chao, Sophie. (2022b). *In the Shadow of the Palms: More-Than-Human Becomings in West Papua*. Durham and London: Duke University Press.

Faulder, Dominic. (2023). NASA satellites show fires ablaze across Southeast Asia as farmers resort to slash-and-burn agriculture. Nikkei Asia. https://asia.nikkei.com/Spotlight/The-Big-Story/Thailand-s-air-pollution-crisis-deepens-amid-seasonal-crop-burning.

GISTDA. (2022). Report summarizing the forest fire and smog situation: From satellite data for the year 2022. Bangkok.

Goldstein, Jenny Elaine. (2019). “The Volumetric Political Forest: Territory, Satellite Fire Mapping, and Indonesia’s Burning Peatland.” *Antipode* 52(4): 1060-1082.

Greenpeace. (2020). Maize Plantation, Burn scars, and Hotspot Monitoring from Satellite Imageries Between 2015-2019 in Mekong Sub-Region (Northern Thailand, Northern Lao PDR, and Shan State of Myanmar). Bangkok.

Greenpeace (2021). Not So Amazing Maize: Mapping 20 years of maize and deforestation in Thailand. https://www.greenpeace.org/thailand/publication/24719/food-agriculture-mapping-20-years-of-maize-and-deforestation-in-thailand/

Haraway, Donna. (2015). “Anthropocene, Capitalocene, Plantationocene, Chthulucene: Making Kin.” *Environmental Humanities* 6(1): 159–165.

Haraway, Donna. (2016). *Staying with the Trouble: Making Kin in the Chthulucene*. Durham and London: Duke University Press.

Hetherington, Kregg. (2020). *The Government of Beans: Regulating Life in the Age of Monocrops*. Durham and London: Duke University Press.

Jensen, Casper Bruun. (2021) “Material Itineraries: Southeast Asian Urban Transformations.” *East Asian Science, Technology and Society: An International Journal* 15(2): 124-134.

Malm, Andres, and Hornborg, Alf. (2014). “The geology of mankind? A critique of the Anthropocene narrative” *The Anthropocene Review 1*(1): 62-69.

Moore, Jason. (2015). *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. London and New York: Verso.

Moore, J. W. (ed.). (2016). *Anthropocene or Capitalocene? Nature, History, and the Crisis of Capitalism*. Binghamton, NY: PM Press.

Moore, J.W. (2017) “The Capitalocene, Part I: on the nature and origins of our ecological crisis.” *The Journal of Peasant Studies* 44(3): 594-630.

Nguyen Ngoc Linh Thao, Sittichai Pimonsree, Kritana Prueksakorn, Pham Thi Bich Thao, Patipat Vongruang. (2022). “Public health and economic impact assessment of PM2.5 from open biomass burning over countries in mainland Southeast Asia during the smog episode.” *Atmospheric Pollution Research,* 13(6).

Qinqin Chen & David Taylor. (2018). “Transboundary atmospheric pollution in Southeast Asia: current methods, limitations and future developments.” *Critical Reviews in Environmental Science and Technology* 48(16-18): 997-1029.

Sangkhamanee, Jakkrit. (2021) “Bangkok Precipitated: Cloudbursts, Sentient Urbanity, and Emergent Atmospheres.” *East Asian Science, Technology and Society: An International Journal* 15(2): 153-172.

Scott, James C. (2009). *The Art of Not Being Governed: An Anarchist History of Upland Southeast Asia*. New Haven and London: Yale University Press.

Streets, D. G., Yarber, K. F., Woo, J.-H., and Carmichael, G. R. (2003). "Biomass burning in Asia: Annual and seasonal estimates and atmospheric emissions." *Global Biogeochem. Cycles*, 17: 1099.

TIJ. (2566). *RoLD Environmental Justice Forum EP.1 Transboundary Haze Pollution and Alternative Development Approach*. https://tijrold.org/2023/06/30/rold-environmental-justice-forum-ep-1/

Vaddhanaphuti, Chaya. (2023). "Politics of Hotspot and Uncertainties in Space and Time of the 'FireD' System: A Case Study on Forest Fire and Haze Pollution in Chiang Mai 2022" *Social Sciences Academic Journal, Faculty of Social Sciences, Chiang Mai University* 35 (1):188-235.

van Schendel, W. (2002). "Geographies of Knowing, Geographies of Ignorance: Jumping Scale in Southeast Asia." *Environment and Planning D: Society and Space 20*(6): 647-668.

Vongruang, Patipat, and Pimonsree, Sittichai. (2020). "Biomass burning sources and their contributions to PM10 concentrations over countries in mainland Southeast Asia during a smog episode" *Atmospheric Environment,* 228.

World Health Organization (WHO). (2022). "Ambient (outdoor) air pollution" https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health