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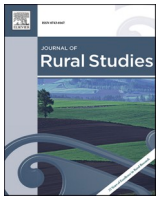

Variegated forms of planetary ruralisation: A multiscalar contextual analysis of evolving ruralities of China's Dike-Pond System

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ABSTRACT

Urban-centric attempts to disrupt the urban-rural binary have provoked a re-envisioning of rurality/ruralisation in recent rural scholarships, refracted through the lens of planetary and relational thinking. This paper engages the nascent field of planetary and relational rural geographies by proposing a 'multiscalar contextual approach' to showcase how planetary rurality should be understood within historical-geographically variegated contexts. This multiscalar contextual analysis enriches, substantiates, and supplements emerging planetary and relational rural geographies by synthesising the political-economic approach and post-humanistic thinking to accentuate the changing forms of planetary ruralisation across multiple spatial scales and historical periods. These variegated forms result from the interplay between multiscalar political-economic forces and diverse more-than-human agencies, generating uneven social, economic, and ecological impacts. Through a historical-geographical analysis of how China's Dike-Pond System (DPS) – a centuries-old integrated aquaculture-agriculture system – has evolved and adapted to capitalist planetary urbanisation, this paper interrogates how Chinese rurality, while exhibiting certain commonalities with rural changes across global contexts, undergoes dynamic changes and generates distinct spatio-temporal varieties. Specifically, we showcase DPS's transformation across three distinct political-economic conjunctures: from 'green yet colonial rurality' (1500s–1900s), through 'backward rurality' (1980s-2012), and to 'upgraded and romanticised rurality' (2012-present).

1. Introduction

Recent rural scholarships have raised concerns over the urban-centric and totalising epistemologies of urban-rural relations, and explicit or implicit assumptions of the demise of rural ontologies in urban theories (Gillen et al., 2022; He and Zhang, 2022; Krause, 2013; Wang et al., 2023). To counter the teleological assumptions of a wholly urbanised planet, scholars have advocated reconceptualising rurality from the lens of planetary thinking and rural-urban relationality. First, they propose 'planetary rural geographies' to counter the narrative of planetary urbanisation (Brenner and Schmid, 2015). It is argued that rurality is not residual but an indispensable part of the planetary system, and that the sustainable development of the rural is of planetary significance (He and Zhang, 2022; Wang et al., 2023). Despite the planetary urban revolution, there is still "an ongoing rural form of planetary living, outside the claims of urbanisation" (Kumar and Shaw, 2020, p. 155). Second, they have advanced a relational perspective towards ruralisation to reveal the ongoing reinvention of rurality at the rural-urban interface, instead of city-centred socio-spatial transformations (Gillen et al., 2022; Qian et al., 2025). In all, the concept of planetary or relational ruralisation embodies dual connotations: on the one hand, alongside planetary urbanisation, there exists a dialectical twin process of planetary ruralisation unfolding through distinct socio-spatial logics; on the other, against the backdrop of globalisation, rural and urban areas exhibit increasingly interconnected relationships and material, discursive, and metabolic exchanges at a planetary scale, wherein rural locales function not as passive and residual recipients of expanding urban functions but as agential nodes actively reconfiguring these rural-urban networks.

While planetary perspectives have undoubtedly enriched understandings of rurality, we contend that a synthesis of these theoretical works reveals significant blind spots, despite that the extent to which different perspectives are guilty of the problems are uneven. First, current planetary frameworks are predominantly oriented towards broader theorisations and generalisations across rural areas globally. This tendency risks essentialising or romanticising certain properties of the rural

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as given or inherent. Losing sight of spatiotemporal variations, rural areas tend to be idealised and mythologised as paragons of planetary environmental sustainability, in contrast to the ecological crisis brought about by excessive urbanisation (He and Zhang, 2022; Wang et al., 2023). This predisposition is perhaps attributed to an ingrained and pervasive inclination – shared by scholars, policymakers, practitioners (such as architects and artists), and rural gentrifiers – to engage in rural nostalgia, and to seek out rural authenticity and a pastoral ideal (Chen et al., 2023; Yang and Xu, 2022). This romanticisation extends to the assumption that rural communities are endowed with ecological knowledge and thus obscure the multifarious crises facing contemporary rural areas, including the pollution caused by intensive farming, vulnerabilities of the infrastructural, lack of employment, and pervasive social inequalities (Ghosh and Meer, 2021; Kumar and Shaw, 2020; Schneider, 2017).

Second, the relational theorisations of ruralisation (e.g., Gillen et al., 2022), although noting the situatedness, diversity, and variety of ruralities, have so far not engage in depth with more-than-human ways of knowing the rural (Kallio and LaFleur, 2023). They have showed limited analysis of agentic roles of nonhuman actants in shaping heterogeneous rural lifeworlds and rural-urban linkages, as Wang et al. (2023) have recently pointed out incisively (also Duggan and Peeren, 2020; Kallio and LaFleur, 2023; Lendvay, 2021). Nevertheless, nonhuman actors and ecological processes play crucial roles in constituting both the discursive and material dimensions of variegated ruralities, as they actively participate in defining what constitutes 'the rural', while simultaneously shaping the material realities of rural practices (Kallio and LaFleur, 2023; Lendvay, 2021; Wang et al., 2023). Such post-humanistic thinkings transcend mere representational analyses by demonstrating how planetary rurality emerges through dynamic and complex spatial topologies, where nonhuman actors are co-constitutive forces in the ongoing (re)configuration of rural spaces across differentiated historical-geographical contexts.

We posit, therefore, that the research agenda of planetary/relational rural geographies can be further enhanced by examining how rurality persists across diverse political-economic conjunctures and how more-than-human relational networks shape the varied forms of planetary ruralisation. While variegated ruralities do not constitute an entirely novel topic in rural studies, our exploration of this debate aims to initiate a dialogue with emerging planetary and relational frameworks on the making and remaking of rurality. Our inquiry addresses two fundamental research questions: How does planetary ruralisation manifest as a historical-geographically variegated process? In what ways are the variegated forms of planetary ruralities shaped by multi-scalar political-economic dynamics and heterogeneous more-than-human agencies? In addressing these questions, we engage in a synthesis of political economy perspectives and recent post-humanistic orientations to propose a 'multiscalar contextual approach.' This framework elucidates how rurality exhibits planetary trends such as neoliberalisation and agricultural intensification while simultaneously undergoing mutation and differentiation within multi-scalar political-economic contexts and more-than-human networks. The conceptualisation of 'multiscalar contexts' encompasses entanglements between political-economic agents/forces and heterogeneous nonhuman actors across multiple scales. Through this framework, we conceptualise rurality as a dynamic and provisional construct co-constituted by diverse elements (Woods et al., 2021), whereby human and non-human actants, as well as political-economic processes, continuously interact and transform each other within specific social, cultural and institutional milieus (Deleuze and Guattari, 1987).

Rural China is increasingly integrated into global economic and social networks (Liu et al., 2022a,b; Long and Liu, 2016). This paper interrogates how the rurality of the Dike-Pond System (DPS; Ch: ji tang xi tong) in China, while exhibiting commonalities with global ruralisation, manifest distinctive variations shaped by multiscalar political-economic contexts and more-than-human networks. Through an examination of three distinct political-economic conjunctures, we elucidate the evolutionary trajectories of DPS rurality: from a paradoxically 'green yet colonial rurality' in the early globalisation and colonial era (1500s–1900s; see Section 4), to a 'backward' rurality targeted for elimination through industrialisation and urbanisation under 'state entrepreneurialism' (Wu, 2020; Zhang and Wu, 2022) (1980s-2012; see Section 5), and finally to an 'upgraded and romanticised rurality' within state-engineered rural eco-modernisation and nostalgic cultural imaginaries premised upon the state mandate of Ecological Civilisation and Rural Revitalisation (2012-present; see Section 6). Ultimately, this longitudinal analysis reveals effectively how multi-scalar political--economic forces and more-than-human networks continuously reconstitute variegated forms of planetary rurality across different historical-geographical contexts. It encourages us to link urban and rural histories over a longue durée arguably longer than what the planetary urbanisation/ruralisation thesis has focused on thus far.

2. Variegated forms of planetary ruralisation: a multi-scalar contextual approach

2.1. Planetary urbanisation versus planetary/relational ruralisation?

Attempts to disrupt the rural-urban binary have been dominated by urban-centred theories and approaches (He and Zhang, 2022), inter alia, Planetary Urbanisation and Urban Political Ecology. The planetary urbanisation thesis suggests that urbanisation today is not confined to cities but is a universal and planetary process. With planetary urbanisation 'exploding' beyond the conventional geographical limits of cities, there is no longer a constitutive 'outside' to the urban (Brenner and Schmid, 2015), as places traditionally deemed rural or pristine are increasingly exhibiting urban characteristics or drawn into urban processes. Meanwhile, the pervasive nature of urbanisation has spurred the urban political ecology scholarship to challenge the traditional distinction between cities and the countryside as two juxtaposed and bounded spatial categories (Angelo and Wachsmuth, 2015; Kaika and Swyngedouw, 2011). Engaging with the planetary urbanisation thesis, urban political ecology calls for attention to planetary 'urbanisation of nature' that transcend conventional urban-rural demarcations. These processes unfold by means of complex metabolic reconfigurations whereby natural resources, e.g. hydrological systems, extractable mineral soils, and greens spaces, undergo socio-material morphosis into urban construction and infrastructural systems encompassing water provision, energy circulation, and electrical distribution under the confluence of capital, labour, and technology (Angelo and Wachsmuth, 2015; Kaika and Swyngedouw, 2011; Tzaninis et al., 2021).

In all, PU and UPE, in their attempts to disrupt the rural-urban binary, have largely reproduced urban-centric epistemologies, relegating the rural to a residual category that evades full theorisation on its own terms. They tend to privilege a totalising and teleological narrative of the urbanisation of everything and everywhere, leaving little room for alternatives, especially the persistence of the rurality in terms of "land, livelihoods and lifestyles" (Gillen et al., 2022, 188). Unconvinced with urban-centric approaches, recent rural scholarships contend that, while urbanisation has historically represented a prevalent and triumphant trend and epoch, it does not inevitably lead to the demise of rural places and identities. The persistent, resonant, and pervasive elements of the rural constantly redraw and reconfigure the interfaces between the urban and the rural (Gillen et al., 2022; Qian et al., 2025). As Chen et al. (2017, 83) point out, "When we downplay the rural, we elide the lived experiences of millions of people and massive investments of money, time, and regulatory effort by states, political parties, and non-state actors in governing rural landscapes and inhabitants".

Hence, works in rural studies have reconceptualised rurality/ruralisation from the lens of planetary thinking and rural-urban relationality (Gillen et al., 2022; He and Zhang, 2022; Wang et al., 2023). First, scholars have proposed to study planetary rural geographies to counter

urban-centric narratives that erase or subsume the rural (He and Zhang, 2022; Wang et al., 2023). In He and Zhang's (2022) critique of the marginalisation and inferiorisation of the rural under industrialisation and urban-centric development models, they point out that the rural is an integral part of the planetary system, and sustainable rural development is crucial for planetary goals. Rural communities are key nodes in the planetary networks of resources, people, information, and knowledge (Wang et al., 2023). In addition to the green supplies that rural areas inject into the planetary system, the rural is also home to innovative and alternative economic activities, business models, and cultural practices (Qian et al., 2025). Rural areas, therefore, need to play a unique role in addressing planetary crises such as climate change, biodiversity loss, food security, etc. (He and Zhang, 2022).

Second, Gillen et al. (2022) propose a relational approach to ruralisation by attending to rural-urban relationality. They have reconceptualised urban-rural relations from the standpoint of ruralisation by identifying three prominent rural dynamics in Southeast Asia: in-situ ruralisation, extended ruralisation, and rural returns. In-situ ruralisation refers to the multifaceted ways smallholders and farming activities survive in rural areas despite escalating rural dispossession, dislocation, and displacement. Extended ruralisation highlights how various rural imaginaries, strategies, and practices geographically extend to cities and shape urban processes (e.g., rural migrant enclaves in cities characterised by intense rural kinship networks or socio-cultural ties to home places). Rural returns capture both the physical return of people with rural origin and the reproduction of rural identities and lifestyles among new migrants from cities, even if some have never experienced rural.

However, there are still analytical pathways that remain underexplored or overlooked. First, these works tend to identify planetary ruralisation as expedient solutions to global crises or other challenges taking effects at broader scales produced by capitalist processes of planetary urbanisation (He and Zhang, 2022). Also, as Ghosh (2022) has observed, Gillen et al.'s (2022) ruralisation thesis emphasises social reproduction but neglects state-mediated and/or capital-led agrarian changes and agro-industrial restructuring (Ghosh and Meer, 2021). This lack of deep engagement with political-economic parameters of contemporary rural changes may risk reifying, prioritising, or idealising certain characteristics of the rural, while bracketing more complex and multifaceted rural configurations, especially those exemplifying the provisional, fragile and ambivalent nature of rural sustainability. According to narratives of rural decline and dystopia (Bock, 2016; Liu et al., 2022a,b; Mamonova and Sutherland, 2015; Rofe, 2013; Schneider, 2017), rural communities are increasingly faced with variegated challenges amidst economic restructuring and demographic shifts, alongside environmental pressures (Li et al., 2019). Emerging rural crises such as rural pollution, food safety, and urban-rural inequalities have been observed, all resulting from intensifying urban-rural interdependencies and complex interplays between rural transformations and contemporary capitalist modes of production (Schneider, 2017; Wang et al., 2023). Driven by developmentalism, rural industrialisation and industrial farming have led to faecal pollution, nutrient depletion, and farmers' dispossession, turning these areas into 'cesspools' of capitalist crises. Such accounts have highlighted the need for a nuanced understanding of rural life that goes beyond a simplistic distinction between rural idyll and urban alienation (Bock, 2016; Halfacree, 2007).

Second, the majority of these theoretical works, except the notable exception of Wang et al. (2023), have largely overlooked the more-than-human dynamics that are conditioned, and also condition, urban-rural interactions, and how they usher in complex exchanges and circuits of people, resources, and knowledge that cut across the urban-rural divide. Rural areas are diverse, hybrid, and more-than-human spaces continuously shaped by the works of human and nonhuman actors entangled within wider power relations (Kallio and LaFleur, 2023; Lendvay, 2021; Wang et al., 2023). For example, Lendvay (2021) highlights how watermelon farming in Hungary emerges from the collaboration of plants, pollinators, farmers, and agricultural technologies, which collectively contribute to community resilience and rural transformation. Darnhofer (2020) views farms as active assemblages of soil, plants, animals, and machinery rather than passive entities managed by farmers. These insights hint at the more-than-human constitution of rural places and spaces, as well as the complex exchanges and flows that connect rural and urban areas.

2.2. *A multiscalar contextual framework: integrating political economy and post-humanistic thinking*

To better synthesise insights from the pioneering contributions reviewed above, and enrich studies on relational and planetary rurality, this paper works with a multiscalar contextual approach to theorise variegated forms of planetary ruralities (Fig. 1). By integrating political economy perspectives with post-humanistic accounts, this lens casts light on three analytical avenues. While each of the dimensions has been extensively addressed in their own terms, a synthesis applied to the historical studies of evolving ruralities will arguably add extra insights to the spatial contours and historical contingencies of planetary rurality.

The first analytical avenue, drawing on political-economic perspectives, emphasises the dynamic production of planetary rurality across global, national, and regional accumulation regimes. At the global level, research has identified wider political-economic forces that have shaped the shared characteristics of planetary ruralisation across diverse contexts. Most importantly, it is widely recognised that neoliberal globalisation and large corporate interests have significantly transformed rural areas and livelihoods worldwide (Shucksmith and Brown, 2019). In the context of neoliberal globalisation, transnational and large corporations influence rural economies and agriculture by monopolising seed supply, integrating farms into global value chains and promoting financialisation (Shucksmith and Brown, 2019). Meanwhile, rural territories worldwide exhibit similarities characterised by the intensification of and scaling-up of agricultural production (de Roest et al., 2018), the commodification of pastoral landscapes (McCarthy, 2008), and the proliferation of tourism economies (Yang and Xu, 2022).

At the national scale, state-orchestrated rural political-economic initiatives engender distinctive trajectories of planetary ruralisation (Chen et al., 2017; Chen and Pow, 2023; Schneider, 2017). Within the Chinese context specifically, the state assumes a decisive role in reconceptualising and restructuring rurality (Liu et al., 2022a,b; Long and Liu, 2016). The twin national political-economic imperatives – Ecological Civilisation and Rural Revitalisation – have fundamentally reconfigured Chinese rurality throughout the past decade (Long and Liu, 2016). Since the 2010s, ecological civilisation has emerged as a prevalent political discourse in response to acute environmental challenges and the imperative of sustainable development (Hansen et al., 2018). Recent scholarship indicates that Chinese rurality, vis-à-vis the construction of ecological civilisation, has transitioned into a post-productivist regimes propelled by two principal catalysts: first, a governmental policy reorientation from agricultural productivism toward ecological restoration and premium food production; and second, state-led initiatives aiming at aestheticisation and spatial reconfiguration of rural landscapes, responding to the growing desire for pristine natural environments and idyllic agrarian experiences (Wu et al., 2024). Concurrently, the state initiated the rural revitalisation campaign in 2017, an ambitious programme that, while drawing inspiration from the post-productivist ethos, also fosters the agro-industrial sector in rural areas. This campaign envisions a rural transformation from primary agricultural production to the integration of primary, secondary, and tertiary activities (Ch: san chan rong he), thus enhancing the strategic positions of rural areas for value creation and distribution in commodity economies (Liu et al., 2020). More specifically, the state mobilise strategic interventions such as sophisticated agricultural product processing, e-commerce platforms for agricultural commodities, and rural tourism development to create a new horizon of rural economic growth (Liu

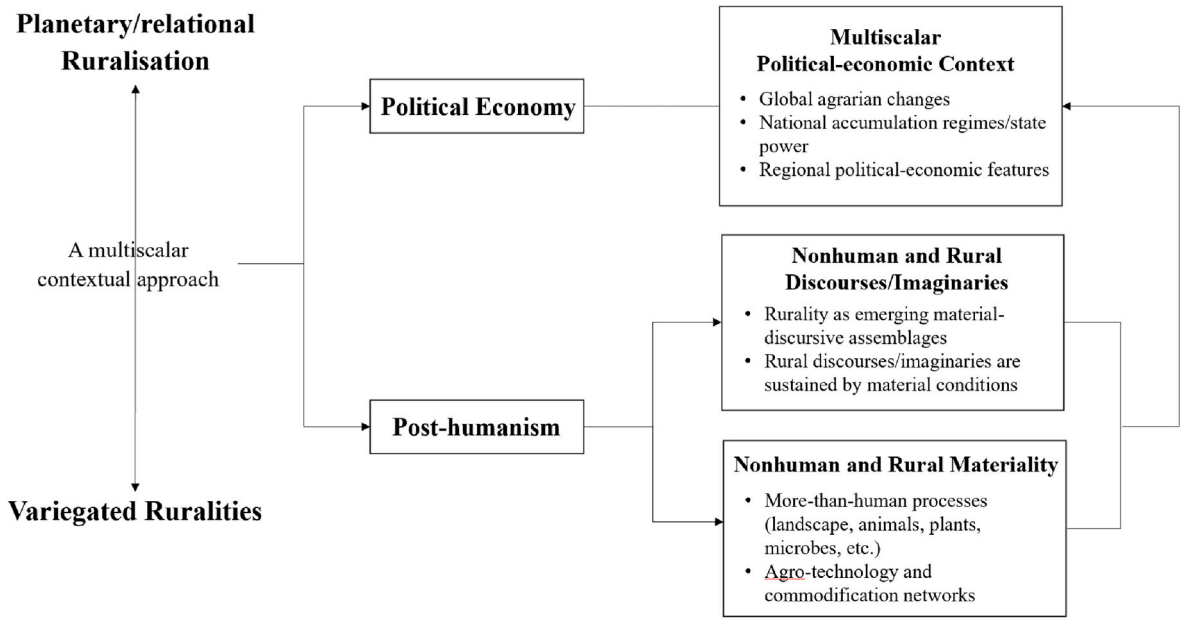

Fig. 1. Multiscalar contextual framework.
Source: Authors

et al., 2020).

Similarly, regional political-economic conditions encompassing place-based power matrices, urbanisation and land use patterns, and industrial structures exert profound influence on the reconfiguration of rural spaces (Li et al., 2019; Lin, 1997). The DPS examined in this research, situated within China's Pearl River Delta (PRD) region, is a telling case epitomising the point. First, historical linkages existed between the PRD's mulberry dike-fish pond systems and the ancient Maritime Silk Road. The flourishing Maritime Silk Road commerce directly catalysed the ascendance of silk industry during the Ming and Qing dynasties. Subsequently, following China's reform and opening-up, the PRD region assumed a pivotal role in China's transformation into the 'world's factory.' From the late 1970s, the PRD embarked on what scholars have characterised as 'foreign investment-induced exogenous-urbanisation' (Yang, 2020) or 'grassroots rural industrialisation' (Lin, 1997), wherein foreign capital strategically coupled with rural territories, metamorphosing PRD villages and townships into global production nodes. This developmental trajectory precipitated unregulated industrial expansion in rural areas and insufficient environmental planning, generating fragmented and disorderly mosaics of developmental that continue to influence rural communities and dike-pond systems. Most recently, under the imperatives of Ecological Civilisation and Rural Revitalisation, local authorities have begun to prioritise the integration of rural development with traditional cultural heritage preservation and ecological restoration (Gong et al., 2022).

Alongside political-economic analysis, we draw on recent post-humanistic accounts in rural studies, particularly the Callonian performative approach (Maclaren, 2019; Wang, 2022), to demonstrate how multiscalar political-economic processes are concurrently constituted by nonhuman actors. According to this approach, rurality is not a pre-given and static entity but rather is performed and enacted through the heterogeneous association between human and nonhuman actors (Wang, 2022). Such an epistemic orientation conceives of rurality as an emergent process, materially and discursively constructed through assemblages of heterogeneous elements (Maclaren, 2019). It avoids reducing rurality to predefined categories but remains open to multifarious ways in which rural spaces are enacted, contested, and transformed in *discursive* and *material* practices.

First, nonhuman agency constitutes or shapes the discourses, imaginations, and definitions of rurality. The discursive making of rurality is a heterogeneous and fluid process, wherein nonhuman actors participate alongside human agents in defining what actually constitutes 'the rural' and how it evolves. The materialities of objects exert a crucial role in producing specific rural discourses, as rural discourses and imaginations require material conditions and devices to be enacted and sustained (Wang, 2022). The making of rural discourses involves struggles between diverse and competing social-technical arrangements, whereby different actors mobilise various social and material elements to construct their ideal discourses and visions of rurality (Wang, 2022). As Wang's (2022) examination of Taiwan's agricultural-industrial spaces demonstrates, factory-emitted chemical compounds not only transform the biophysical properties of rural environments but also motivate environmental advocates and local inhabitants to reconceptualise the ontologies of 'rurality,' thereby precipitating discursive practices and political mobilisations. As demonstrated by Kallio and LaFleur's (2023), epistemic constructs, discursive frameworks, and everyday practices of regenerative agriculture are instantiated through a broad range of more-than-human interconnections. The representational epistemologies dominated by corporate and technoscientific interests oriented toward extraction and commodification systematically reduce agricultural landscapes to carbon metrics, thereby eliding the complex multispecies relationalities that constitute agrarian ecologies. Farmers' proximate, relational, and reciprocal ways of 'knowing' agricultural landscapes through their direct, sensory engagement with the material, living, and more-than-human ecologies of agriculture are undermined by commodified human-natural relations.

Second, nonhuman agency constitutes the material realities of planetary rurality. This moves beyond representational or discursive analyses to highlight how planetary rurality emerges through the relational configuration of diverse human and non-human actants in dynamically evolving and reconfigured spatial topologies. In other words, to further enrich the relational rural geography entails looking beyond human activities and the 'social construction' of rurality to consider how nonhuman entities – animals, plants, microbes, technologies, the environment, etc. – play agentic roles in shaping plural and highly indeterminate rural material practices. This grounds rurality in historical, multiscalar, and context-specific material interactions between humans and nonhuman elements (Darnhofer, 2020; Maclaren, 2019; Woods, 2010). These material interactions, occurring through activities like farming, mining, and forestry, have enabled rural places to

engage in global networks and differentiate themselves (Wang et al., 2023). For instance, traditional rural communities have demonstrated proficiency in harmonising their existence with the rhythms of ecologies through practices such as crop rotation, intercropping, terraced farming, and rice-duck-fish co-culture systems (Shucksmith and Brown, 2019). Similarly, dynamics of contemporary rural practices are being significantly altered by nonhuman elements such as chemicals and technologies, particularly in intensive farming (Schneider, 2017). For instance, confined, high-density production systems in modern poultry serve as ready-made incubators for the dissemination of diseases across the human-nonhuman divide (Hinchliffe et al., 2017; Wang et al., 2023). Over the past decades, the environmental and health consequences of intensive farming have precipitated the revival and global promulgation of regenerative agriculture to foster symbiotic and harmonious human-nonhuman relationships.

3. Background and methodology

In contrast to more decentralised place-based agricultural practices characteristic of China, such as rice-duck-fish cultivation systems, the PRD's DPS represents a large-scale, highly industrialised agricultural modality. Its selection as our empirical focus derives from its profound historical depth and extensive global interconnections, which render it particularly apposite for the theoretical concerns advanced herein. The DPS represents a five-century historical trajectory, having been deeply integrated into global trade networks since the sixteenth century, when silk production strengthened PRD's position as a critical node within the Maritime Silk Road. Subsequently, during the contemporary ascendance of the PRD as a global manufacturing epicentre, the DPS has been intricately entangled with planetary urbanisation, vividly demonstrating the evolutions of rurality in conjunction with increasingly planetary-scale urban-rural interconnections. In all, the DPS epitomises how a traditional agricultural system negotiates multiscalar political-economic forces across distinct historical and political-economic epochs.

The DPS area is located in the central-western Pearl River Delta (Fig. 2), primarily distributed across Foshan City, Jiangmen City, and six northern towns in Zhongshan City, with a total land area of 1753 km^2. This paper investigates the socio-ecological evolution of DPS in Foshan City. The districts of Nanhai and Shunde in Foshan, featuring the most intensive and extensive DPS landscapes, are the primary focuses in this study. These districts are also emblematic of China's manufacturing prowess, comprising two of the renowned 'Four Guangdong Tigers' that pioneered China's rise as the world factory. The DPS transformations in these areas implicate intricate multiscalar human-non-human and socio-natural interplays, making Foshan an ideal site to examine the situatedness and evolution of rurality amidst rapid urbanisation (Fig. 2).

First, the DPS offers a lens into the symbiotic socio-ecological interactions between humans and nonhumans. DPS proliferated across the PRD during the 16th century. It originated from an anthropogenically engineered hydrological landscape. As early as the 11th century, local inhabitants initiated one of the most extensive polder embankment projects in ancient China – the Sangyuanwei Polder Embankment System (Ch: 桑园围) in Foshan City. This system was recognised as a World Heritage Irrigation Structure by the International Commission on Irrigation and Drainage in 2020. The PRD, the most extensive alluvial plain in Southern China, is characterised by low elevation, abundant precipitation, and complex riverine networks. In ancient times, recurrent floods substantially threatened agricultural production and farmers' livelihoods. The Sangyuanwei System facilitated water management through the engineered control of embankment drainage, allowing for the ingress and egress of water into or out of the polders in accordance with seasonal fluctuations and water availability.

The DPS is a traditional and integrated aquaculture cum agriculture system that emerged from the large-scale artificial water conservancy

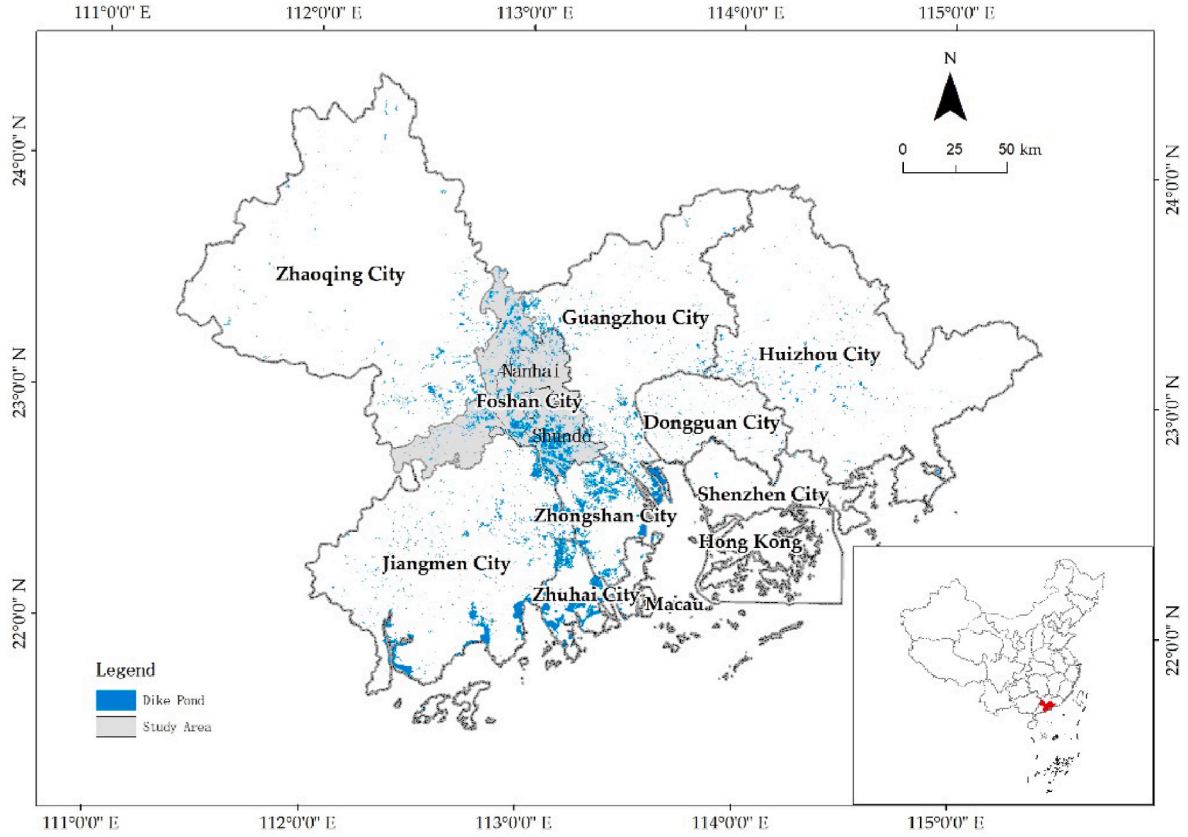

Fig. 2. Locations of dike pond and study area in the Pearl River Delta.
Source: Authors

system of Sangyuanwei. Within the Sangyuanwei embankments, increasing sediment obstructed riverways, leading to waterlogging issues following floods. In response, the local community excavated low-lying tracts of land within the embankment, transforming them into ponds and repurposing the soil to construct pond dikes, and thereby creating the DPS. These ponds served as sites for aquaculture (raising fish, shrimp, or other aquatic species) and the irrigation of crops on dikes, while the dikes facilitated the cultivation of crops such as mulberry trees, sugarcanes, vegetables, and fruits, as well as the raising of livestock. The aquaculture conducted in the ponds and the agricultural practices on the dikes complement each other, creating a seamless cycle of material and energy flow. This synergy maximises the use of available resources and promotes a balanced and sustainable ecosystem. In sum, the DPS has considerable socio-ecological significance, including flood prevention, agricultural production, pollution reduction, biodiversity maintenance, and local climate modification.

Second, the DPS's socio-ecological transformations reflect shifting political-economic dynamics in tandem with proactive state-led restructuring of rural spaces and livelihoods. Over the past four decades of China's economic reforms, the PRD, one of China's most rapidly urbanising regions, has seen urban built-up areas almost tripled. The PRD charted a distinct development path fuelled by rural industrialisation policies promoted by grassroots town-and-village administrations. Epitomising a form of rural state entrepreneurism (Wu, 2020), the entrepreneurial agency of local states is evident in varied rural development projects, shaping agrarian change through vigorous state interventions like providing special-purpose agricultural loans and agrarian science and technology support. The state-led rural industrialisation has drastically altered the DPS's social-ecological functions and spatial configurations, shifting from traditional green agricultural ecosystems to intensive farming, urbanised or peri-urbanised space, and manufacturing hotspots. Pond areas in Foshan plummeted from 786.96 km^2 in 1980 to 414.48 km^2 in 2017, i.e., a 47.33 % drop (Guangzhou Institute of Geography, 2021). The DPS's vernacular landscapes degraded into intensive monocultural aquaculture, generating issues including water eutrophication and heavy metal accumulation in sediments, which contaminated water quality and posed risks to public health. Yet, urbanisation or industrialisation has not entirely obliterated agriculture or rural spaces, as modern intensive aquaculture ponds remain to be a significant provider of freshwater fish to neighbouring cities and international markets.

This study serves as an extension of the DPS research conducted by Guangzhou Institute of Geography and spanned a long period, to which some authors of this paper are affiliated. Guangzhou Institute of Geography, the leading entity in China's DPS research, boasts four decades of experience in research and practical engagements related to DPS. Building on rich knowledge accumulated throughout this extended period, field research specific to this study was conducted from May 2019 to October 2023 in Shunde and Nanhai Districts, involving 25 typical villages where the DPS is most concentrated. This study conducted 15 focus group interviews with various government departments, including five with the Guangdong Provincial Department of Natural Resources, Foshan Municipal Resources Bureau, and the Agriculture Departments of Nanhai and Shunde districts, as well as ten with town-and-village governments. These discussions provided a top-down understanding of the evolution of DPS's agrarian production (e.g., farming area, types of breeding, output value, etc.), socio-ecological impacts, and policy interventions. Simultaneously, in-depth interviews were conducted with 35 DPS farmers and 15 residents not engaged in DPS, providing a bottom-up perspective on changing farming methods, technologies and techniques, rural landscapes, and ecological functions of DPS. Furthermore, this research utilised extensive secondary data, including those that were publicly available or circulated only internally within the government, as well as planning reports and academic reports from Guangzhou Institute of Geography. The publicly available materials include local gazetteers, historical archives, and scholarly articles on sericulture, as well as government and media reports. The internal circulars encompass agricultural policy documents of governments at multiple levels, surveys, and statistics, as well as consultancy reports commissioned by Guangzhou Institute of Geography on behalf of the government.

Through triangulation between interview data and secondary archival materials, this study reconstructs the historical evolution of DPS to illuminate how ruralities are enacted through the rhizomatic entanglements between political-economic forces and more-than-human agencies. The analysis of the qualitative materials was conducted through manual coding. We first identified a series of open codes and retained those directly related to the theoretical mission of the paper. Based on axial coding, i.e., the method that establishes logical and conceptual connections between generative codes, we grouped the codes into higher-order categories and themes, eventually building an epistemological framework that casts light on the multiscalar political-economic forces and more-than-human networks underneath relational and planetary ruralities.

The credibility of the research comes from two major sources. First, some authors of the research are affiliated to Guangzhou Institute of Geography's DPS research group, with one of them serving as a senior academic and advisor to the Guangdong Provincial Government. Their sustained engagement with governmental consultancy and academic research, coupled with privileged access to both internal circulars and historical archives, has facilitated a longitudinal and comprehensive understanding of DPS in evolutionary terms. Second, the reconstructed evolution of DPS was then situated within various political-economic conjunctures, which were analysed based on the authors' extensive knowledge on academic discourses and planning praxis on the ground.

4. Green yet colonial rurality: ancient Mulberry-Dike-Pond System and silk trade

This section analyses how the ancient DPS rurality evolved through the social and material interconnections between far-reaching Western trade in the 19th century and local ecological processes in the PRD. It demonstrates how global political-economic forces (Western colonial trade and global economic crisis), national dynamics (Qing Dynasty's geopolitical impotence), and local socio-ecological conditions (PRD's hydrological systems) intersected to produce a distinctly green yet colonial form of planetary rurality. Meanwhile, DPS represented a system within which human and non-human actors co-produced specific ruralities. The system's metabolism relied on carefully orchestrated interactions between multiple non-human actants - mulberry trees, silkworms, fish, microorganisms, and water bodies - whose agencies were utilised but never fully controlled by human interventions.

DPS is an stereotypical circular economy and green agriculture system that builds upon material practices bridging the human and nonhuman divide, exemplifying a self-sustaining model that emerged from traditional agricultural practice (Fig. 3). Based on the types of crops grown on the dikes, the DPS can include sugarcane-dike-ponds, fruit-dike-ponds, flower-dike-ponds, vegetable-dike-ponds, and mulberry-dike-ponds. The most known variation of DPS is the Mulberry-Dike-Pond System (MDPS), accounting for around 37.3 % of the total DPS (Guangzhou Institute of Geography, 2021). MDPS integrates mulberry cultivation, sericulture (i.e., silkworm rearing), and fish farming to create an intricate circular economy and a sustainable eco-agricultural system – that is, mulberry trees provide berries, shade, and windbreak for fishponds. At the same time, the leaves served as feed for silkworms. Silk cocoons were harvested for textile production. Silkworm excreta and chrysalises, which posed potential environmental and health hazards to silkworms, could be used as high-quality fish food. Meanwhile, waste from silkworms, livestock, and crops was used to fertilise fishponds, accelerating the growth of phytoplankton and zooplankton, which further adds to fish food. In return, fish excrement accumulated at the bottom of the pond as humus, a premium fertiliser that acted as a soil

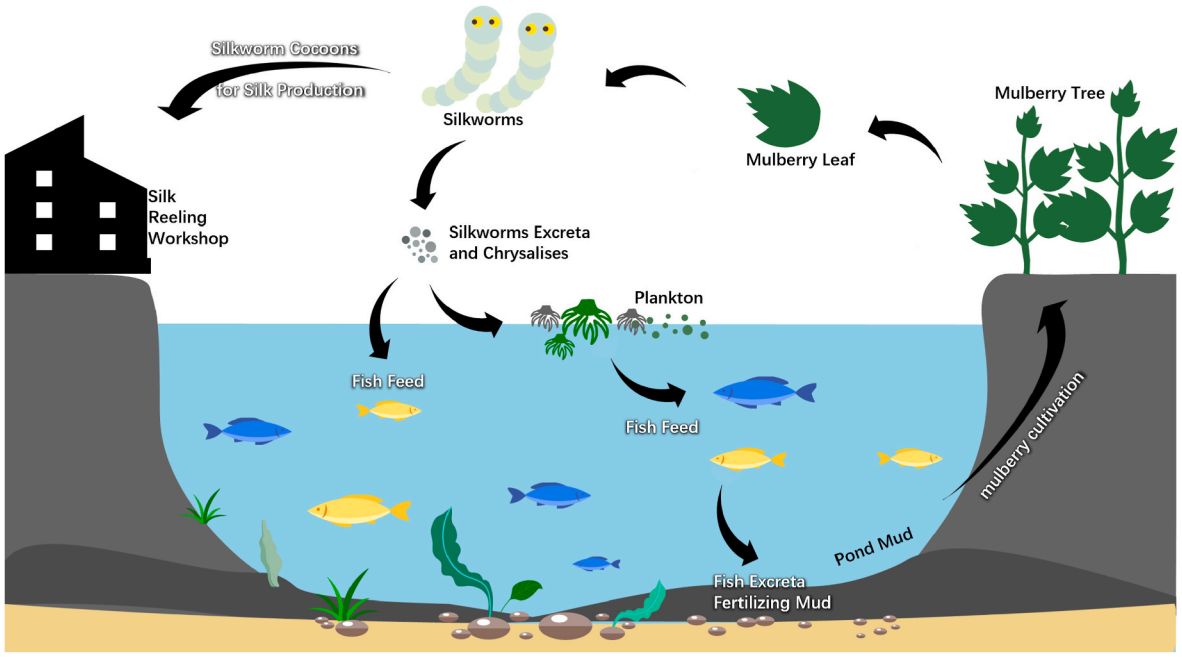

Fig. 3. Ecological circulation of Mulberry-Dike-Pond System.
Source: Authors

conditioner for mulberry tree cultivation on the dike. Because of the organic fertiliser usage, zero-waste generation, and diverse income sources, MDPS was internationally considered a classical sustainable model of eco-agriculture, i.e. representing a green rurality.

In the mid-19th century, the relational networks constituted by Western colonial trade, technological advancement brought by industrial revolution, and local socio-ecological relations precipitated new configurations of the MDPS, while steam-powered machinery and industrial textile techniques were enrolled into existing human-nonhuman entanglements of mulberry trees, silkworms, and traditional farming methods. This network constituted by heterogeneous human and nonhuman actors, while expanding the geographical reach and productive capacity of MDPS through novel socio-technical arrangements, also generated tensions between competing regimes of agricultural production - as evidenced by the conflicts between mechanised factories and manual workshops (see the next paragraph). The introduction of steam devices and modern reeling techniques reconfigured not only labour processes but also nonhuman agencies and metabolic relationships within the MDPS, intensifying the demands on silkworm cultivation and mulberry production while tethering local rural ecologies more tightly to distant Western urban markets through colonial trade relations.

Following Western powers' forced opening of the Chinese market through two successive Opium Wars, a Chinese entrepreneur named Chen Qiyuan returned to his hometown, Nanhai, establishing China's first modern silk reeling factory in 1873. This pioneering endeavour introduced Western steam devices and textile techniques, significantly reconfiguring the region's agricultural practices (Wu, 2019). The silk reeling industry rapidly spread from Nanhai to other parts of PRD. However, socio-ecological conflicts emerged in the nascent stage of technology-driven industrialisation. Chen's factory encroached upon the market share of local manual workshops and was perceived as a threat to local morality due to the employment of both male and female workers within the same plant. In 1881, more than 1000 local artisans united to demolish his factory (Guangdong Provincial Office of Local Chronicles, 2018). The local authority in Nanhai subsequently shut down Chen's factory and confiscated all machines. Following this event, Shunde succeeded Nanhai as the centre of mechanised silk production. By the 1910s, over 300 silk reeling factories were established in Shunde, employing approximately 150,000 workers, the majority of whom were female (Wu, 2019). In 1923, raw silk exports from Guangdong constituted around one-third of China's total output, with Shunde accounting for nearly 90 % (Guangdong Provincial Office of Local Chronicles, 2018). The emergence of modern factories with advanced manufacturing capabilities led to a considerable increase in demand for silkworm cocoons, causing a surge in their market value. This escalation of silkworm cocoon prices significantly stimulated the growth of MDPS. Alongside the prosperity of sericulture, aquaculture also flourished in Foshan, which has to this day remained one of the major freshwater fish-producing areas in China. The accumulation of skills, experience, and techniques contributed to higher incomes for MDPS compared to rice cultivation on farmlands. This resulted in farmers quitting rice cultivation for MDPS (Ch: fei dao shu sang 废稻树桑) (Guangzhou Institute of Geography, 2021; Wu, 2019). Despite the prosperity, global international political-economic shifts also introduced substantial risks to the MDPS. The onset of the Great Depression in 1929 led to a steep decline in silk demand, resulting in many silkworm farmers suffering from bankruptcy or even starvation (Guangdong Provincial Office of Local Chronicles, 2018).

In this sense, the first wave of the MDPS boom reflected long-existing planetary rural-urban connections and multifaceted ruralities involving both green and colonial relations across multiscalar political-economic forces and human and nonhuman divide. The Western powers' demand for raw silk and silk products, emanating from the expansion of the urban textile industry in their home countries, constituted the fundamental drive for the rise of the sericulture industry in rural PRD. Foreign traders congregated in Guangzhou to procure silk products from DPS areas (Wu, 2019). Specialised marketplaces emerged to connect global buyers with local smallholders. A prevalent saying among local farmers states, "*A boat departs carrying silk and returns with silver*" (Guangzhou Institute of Geography, 2021; Wu, 2019). Within this tele-coupling between rural PRD and cities in the metropolitan centres, the rural PRD became enmeshed in the "world system" (Wallerstein, 1989), long predating the rise of the PRD as the world's factory. Apart from shaping urban consumption culture in the West, the MDPS also underpinned PRD's position as a crucial node in Maritime Silk Road

trade with Western cities.

5. 'Backward' rurality amidst state-led entrepreneurial development

In the distinctive political-economic conjuncture of reform-era China, characterised by 'state entrepreneurialism' as a dominant mode of governance (Wu, 2020; Zhang and Wu, 2022), the discursively constructed rurality as a spatial category inflicted by deep-seated 'backwardness' that demanded eradication through the twin processes of rural industrialisation and agro-industrialisation. State entrepreneurialism is a governance paradigm wherein the Chinese state leverages market mechanisms to reassert political legitimacy and enhance governance efficacy. In contrast to Western neoliberalism, the Chinese state is 'using the market or acting through the market, rather than being submissive to the market' (Wu, 2020: 327). In the rural context, the discourses and functions of the rural are constantly rearticulated and engineered by China's potent state apparatus, as well (Chen et al., 2017; Long et al., 2011; Schneider, 2017; Zhang and Zeng, 2021).

This historical conjuncture exemplifies the multiscalar contextual approach by way of the complex interplay between global neoliberal capitalism, state entrepreneurialism, and local socio-ecological transformations. At the global scale, China's integration into world markets demanded economic transformation, while at the national level, state entrepreneurialism emerged as a distinctive governance paradigm that leveraged market mechanisms without surrendering state control. Economic reforms since the late 1970s have dismantled the commune system, replacing it with the Household Responsibility System, granting farmers autonomy in production while maintaining collective land ownership (Webber, 2012). However, the state's push for urbanisation and industrialisation has precipitated rural decline, which is marked by stagnating household incomes, agricultural labour outmigration, rising village-level public debts, governance crises, exacerbated rural-urban disparities, brain drain, and the hollowing out and deterioration of villages (Chen and Kong, 2022; Yan et al., 2021). Since the 1980s, the peasantry has often been associated with backwardness, and the rural is perceived materially and subjectively even as a space of abjection (Yan et al., 2021).

These transformative processes, however, are not merely political-economic but also involve profound reconfiguration of socio-ecological metabolisms and more-than-human relations. The emergent rural assemblages, co-produced through the interplay between entrepreneurial state practices, market forces, technological systems, and heterogeneous nonhuman actants (e.g. silkworm cocoons, heavy metals, fish varieties, modern machinery, artificial fish food, and chemical inputs, etc.), have generated new kinds of socio-ecological contradictions and metabolic rifts in the processes of rural industrialisation and agro-industrialisation.

5.1. *Eradicating rurality through industrialisation and urbanisation*

The PRD's developmental trajectory was described by scholars as a grassroots 'rural industrialisation' transpiring at the town and village levels (Lin, 1997), with villages and towns turning into production hubs for global lead firms, generating consumer goods primarily intended for international markets. Modes of agricultural production and rural ecosystems underwent massive changes amidst rapid rural industrialisation.

First, manufacturing was viewed as superior to traditional DPS in income generation. At the onset of China's economic reform, town and village officials in PRD actively responded to the decentralisation of economic governance by establishing a market-oriented system of land use and management (Tian and Zhu, 2013; Zhu and Guo, 2014). They fully utilised local kinship ties and geographical proximity to Hong Kong, taking bold steps to introduce overseas capital, technology, and production equipment. Against this backdrop, numerous joint ventures were established between village or township enterprises and foreign investors. Foreign investments, initially from Hong Kong and later expanded to include those from Taiwan, Japan, Europe, and the United States, provided equipment, raw materials, and sample products, and were responsible for exporting products, while the governments supplied land, labour, and logistics as compensation (Yang, 2012). Besides, many collective Town-and-Village Enterprises (TVEs) were founded by local governments in the 1980s. Local people were employed as factory workers in TVEs while concurrently dedicating a portion of their time to tending their fishponds and mulberry fields. Nevertheless, the speedy expansion of manufacturing activities significantly reduced traditional DPS practices as people gradually relinquished agricultural labour.

Second, accelerated urbanisation and rural industrialisation encroached upon agricultural space, producing a hybrid rural-urban interface. As industries and services were established in rural areas, the landscape transitioned from being primarily agricultural to a mixture of farmland, DPS, factories, and other urban land uses (e.g., the rising property market underpinned by the proliferation of commodity housing). Urban lands and buildings gradually spread over the prior dike areas, enveloping the ponds. Land for subsistence farming was the first to be taken by urban encroachment, and DPS did not endure long despite its higher profits than the former. Although the aquaculture industry witnessed some growth, as some farmlands were converted into fishponds, the latter were quickly replaced by urban built-up areas and industrial land use. In Nanhai and Shunde, the areas of mulberry cultivation in 1990 constituted only 14.19 % and 2.5 % of those in 1980 (Guangzhou Institute of Geography, 2021). From 1980 to 2017, the area of DPS witnessed a 47.40 % decrease, from 787 km^2 in 1980 to 414 km^2 in 2017, while the urban built-up area increased by 4.21 times for the same period (Guangzhou Institute of Geography, 2021). Meanwhile, manufacturing enterprises attracted a substantial number of rural workers to shift from DPS to factories. In Nanhai, a significant shift in occupational distribution was observed within the span of just a decade (Lin, 1997). In 1982, agriculture was the predominant occupation, employing 58.85 % of local populace, while factory workers made up only 29 %. By 1990, factory workers constituted 41 % of the local workforce, surpassing the agricultural sector, which concurrently experienced a decline to 38.94 %.

Lastly, beyond the political-economic dynamics, DPS's socio-ecological system has been significantly disrupted as a result of a "metabolic rift" (Kaika and Swyngedouw, 2011). Political-economic forces reconfigured existing rural material-discursive relations, destabilising the environmentally sustainable rhythms and enacting new and often degraded forms of human-nonhuman entanglements, such as high-density built areas and land use, as well as environmental pollution. The ratio of dike area to pond area in the DPS, often set as 6:4 as a convention, was an essential factor that determined the efficiency and sustainability of the system. However, farmers expanded ponds for pisciculture while the maintenance of dikes were largely overlooked since the 1980s. Biodiversity was compromised as dike widths diminished from their original expanse of over 20 m to a few meters. Waterways previously linking ponds became obsolete as highways supplanted waterborne transportation. Besides, Foshan City was home to 30,357 village industrial parks, which attracted diverse small factories or workshops involved in sugar refining, cement production, electroplating, e-waste recycling, and textile production. These enterprises were often characterised by outdated production techniques, low-end equipment, and highly intensive energy consumption and pollution (Foshan Municipal Government, 2018). For instance, in the late 1970s, ceramics, led by TVEs, emerged as a pillar industry of Shunde and Nanhai, underpinning extensive urban construction. In the early 1980s, many ceramics factories or brickyards were constructed on mulberry dikes. Farmers excavated soil from the dikes to expand pond areas for pisciculture and to produce bricks or ceramic products, leading to significant soil loss and air pollution. Fluoride levels surrounding ceramic enterprises substantially exceeded China's environmental standards

(Guangzhou Institute of Geography, 2021). Mulberry tree leaves, affected by air and soil pollution, were detrimental to silkworms. The survival rate of larval silkworms decreased, and unhealthy silkworms experienced difficulties producing cocoons. For example, the output of silkworm cocoons in Nanhai decreased from 18,500,000 kg in 1979 to 14,500,000 kg in 1982, resulting in a raw material shortage for local silk reeling factories (Guangzhou Institute of Geography, 2021). Moreover, the emergence of DPS in Foshan benefited from a well-maintained irrigation system. Yet, most sewage discharged from industrial parks was discharged directly into local water bodies without proper treatment, thereby taking a heavy toll on the DPS ecosystem. Persistent and highly toxic heavy metals constituted a major concern, as they were resistant to degradation and tended to accumulate in the environment. This also created considerable risks to the sustainable cultivation of mulberry trees and fish.

This process of rural industrialisation demonstrates how multiscalar political-economic forces operate through more-than-human agencies to produce a form of rurality as backwardness relative to the telos of modernisation. The entrepreneurial state's pursuit of rapid industrialisation was materially enacted through the agency of heavy metals, factory emissions, and compromised soil ecologies, which collectively undermined the metabolic matrices of traditional MDPS. These nonhuman actors became unwitting participants in the state's project of rural modernisation, revealing how planetary rurality might emerged through the intertwining of political-economic imperatives with ecological processes that exceed human control.

5.2. Developing the rural with agro-industrialisation

Meanwhile, Foshan's DPS region in the 1990s witnessed the popularisation of state-led agro-industrialisation to facilitate economic growth. Agricultural practices were transformed through industrial methods, leading to increased productivity and economic output. This included state-led renovation of traditional DPS, introducing new fish species, and switching towards more specialised, intensive farming models. As claimed in many DPS-related internal policy documents (e.g., Shunde District Government, 2006), the local state was determined to "develop agriculture with an industrial mindset" to wipe out rural backwardness.

Firstly, this agro-industrialisation was enabled by a series of local government "DPS overhaul" initiatives that aimed to valorise traditional DPS by enhancing pond fishing productivity since the 1990s. For instance, between 2000 and 2006, the overhaul encompassed 44,469 acres of fishponds in Shunde (Shunde District Government, 2006). District and township-level finance departments allocated 40 million yuan annually, while the District Rural Credit Cooperative disbursed 160 million yuan in loans for pond renovation (Shunde District Government, 2006). The ameliorated production conditions in the refurbished fishponds enticed many leading enterprises, boasting advanced technology and substantial capital, to supplant small farmers vying for contracts. Owing to refurbishment, fishponds deepened, and dike roads broadened, fostering intensive aquaculture of new fish species (see paragraph below).

Secondly, this emerging political-economic reconfiguration was achieved through the active agency of diverse non-anthropogenic actors operating within complex socio-ecological networks. The local state adapted aquatic production to urban consumption patterns by introducing new fish varieties to the DPS regions. Traditionally, the MDPS was characterised by cultivating four prevalent fish species, namely black carp, grass carp, silver carp, and bighead carp, collectively referred to as the 'four Chinese domesticated fish' (Ch: sida jiayu). However, recent practices witnessed a shift towards speciality fish varieties (locally termed 'high-priced fish' or 'high-quality fish') to meet the evolving demands of global and domestic markets. The local state collaborated with agricultural research institutions and universities to introduce high-value-added species from various places of origin, including the Pearl River, Yellow River, Yangtze River, Heilongjiang River, and foreign countries. Through utilising modern breeding techniques, such as genomic selection, hybridisation, transgenesis, and genetic engineering, agro-science facilitated the domestication and localisation of alien species, making them suitable for local aquacultural environments. Since the 1990s, speciality fish species such as mandarin fish, eel, snakehead, California perch, and yellow catfish progressively became the primary varieties raised in DPS areas. By 2007, the output of high-priced fish reached 59.1 % of total DPS fish farming, compared to 31.9 % for the four traditional fish varieties (Guangzhou Institute of Geography, 2021).

Lastly, new human-nonhuman entanglements emerged through the agencement of novel production techniques, technological devices, and industrial outputs, including modern machinery, artificial feeds, and chemical interventions. What has resulted is a more capital-intensive and productivity-oriented form of rurality. The significant increase in stocking density led to a spike in fish yields. For instance, in Shunde, pond fish production in 1980 amounted to 3164 kg per hectare and increased by 7.28 times, reaching 26,205 kg per hectare by 2008 (Guangzhou Institute of Geography, 2021). In certain villages, such as Nanjing Village in Nanhai and Jiangyi Village in Shunde, the production of pond-reared California bass reached as high as 75,000 kg per hectare in 2009 (*ibid.*). Unlike traditional DPS, high-density farming involves extensive use of modern machinery, leading to a series of ecological issues. Farmers commonly employed machines such as oxygenators and power outage alarm systems to address oxygen deficiency resulting from densely stocked fish fry. However, such equipment led to problems of high energy consumption, soil erosion, and pond siltation, described by local farmers as "collapsed dikes and shallow ponds". Also, fish feed witnessed significant changes. The MDPS by-product – silkworm excrement – was once a highly valued feed for domestic fish. However, with the change in cultivated varieties and the use of new feeds, pond fish farming no longer relied on silkworm excrement. As most new fish species were carnivorous, farmers initially used mass-produced frozen fish as feed, adversely impacting water quality. In the middle 2010s, "expanded and pelleted feed" began to be widely used, further stimulating fish yield growth while producing polluted water. The combination of excessively dense farming and poor water quality could facilitate the proliferation of pathogenic bacteria and parasites in the water, posing health risks to aquatic products. The discharge of aquaculture wastewater into water bodies caused significant pollution to local environments, as well.

High-density aquaculture, while generating substantial economic value, engendered deleterious consequences, as well. These more-than-human metabolic disruptions manifested in multifarious ways - from compromised water quality and contaminated ecosystems, to financial precarity and biosecurity concerns. High-density farming and overfeeding led to insufficient dissolved oxygen in water and elevated quantities of phosphorus, nitrogen, and other detrimental substances, causing eutrophication, an overabundance of algae, and ensuing respiratory difficulties and decreased immunity in fish, among other complications (Multiple interviews with local farmers, 2021–2023). Fish epidemics often translate into catastrophic investment failures, inflicting substantial economic losses on local farmers. Significant quantities of fish carcasses were released into local riverine ecosystems, resulting in environmental contamination. When farmers observed epidemic symptoms, they typically mitigated the issue by obtaining water samples for testing and medication at local fish pharmacies to minimise losses. These solutions comprised disinfectants, algaecides, bactericides, parasiticides, and antibiotics, which created another layer of food safety concerns for aquatic products and exacerbated water pollution when discharged into local water bodies (Multiple interviews with local farmers, 2021–2023). However, the PRD was a major freshwater fish farming base in China, with its aquatic products were sold both nationally and globally. In this sense, the geographical reach of health risks extended far beyond local communities, indirectly impacting distant

actors and communities in urban contexts.

The emergence of intensive aquaculture epitomises how the multiscalar contextual approach illuminates the contradictory nature of contemporary planetary rurality. While state-led agro-industrialisation preserved certain rural functions and prevented complete urban subsumption, it simultaneously generated new socio-ecological alienation that transcended local boundaries. The agency of alien fish species, artificial feeds, and pharmaceuticals created rural assemblages that were simultaneously local and global, productive and metabolically disrupted. This reveals how variegated ruralities emerge through the negotiation between state development imperatives and recalcitrant more-than-human agencies that resist full incorporation into capitalist logics. The transformed rurality no longer harboured the eco-friendly and circular economy of the ancient MDPS. DPS itself became a significant source of environmental pollution caused by artificial fish food, medicine, and other chemicals.

6. Upgraded and romanticised rurality under state-led ecological civilisation and rural rejuvenation

The latest historical conjuncture exemplifies the multiscalar contextual approach through the recalibration of political-economic imperatives across global sustainability pressures, national policy mandates, and local socio-ecological transformations. At the global scale, international climate commitments and sustainable development goals have necessitated China's transition from growth-oriented to sustainability-oriented development paradigms. At the national level, the twin policy frameworks of Ecological Civilisation and Rural Revitalisation represent state attempts to reconcile economic development with environmental protection. These multiscalar political-economic reconfigurations have fundamentally reshaped local rurality through the deployment of high-tech agriculture and cultural heritage preservation. In these processes, rural areas are discursively defined as new spaces where economic, environmental, and social-cultural goals can be harmonised; in other words, the refashioned rurality is the epitome of China's new socially and ecologically friendly development. Vis-à-vis this backdrop, two distinct modalities of rurality are being enacted through complex socio-material assemblages. The first exhibits pronounced characteristics of ecological modernisation, characterised by the assemblage of large-scale capital, mechanised production regimes, and industrial complexes (elaborated by Sub-section 6.1). The second encompasses a fundamental reconstitution of rural cultural signification, changing from a space of backwardness to one of romantic nostalgia and authenticity (elaborated by Sub-section 6.2).

6.1. State-sponsored agriculture industrial parks

Exemplifying the principles of ecological modernisation, state-sponsored agriculture industrial parks in Foshan endeavour to cultivate sustainable growth by way of agro-industrial upgrading and leading agricultural firms. In May 2013, the Shunde District Government and the Guangdong Provincial Agricultural Administration signed an agreement to establish a provincial-level agriculture demonstration zone premised on large firms. Although Foshan's freshwater aquaculture industry ranks among the foremost in terms of scale and output, the traditional model was deemed to be largely *extensive*, predominantly based on small family businesses. Over the past decade, the Foshan government has promulgated a series of policy documents to expand and strengthen leading agricultural enterprises. The strategies employed at multiple levels encompass policy supports, financial subsidies, tax reductions, and infrastructure developments to bolster the growth of "agricultural industrial parks" and state-identified lead firms. As of 2019, the total revenue of the city's 173 leading agricultural enterprises reached 112.66 billion RMB, with a net profit of 15.55 billion and export earnings of 225 million US dollars (Guangdong Academy of Agricultural Sciences, 2021). The agro-industrial upgrading reflects the state's aspiration for a more efficient and productive agricultural system to meet the expanding and increasingly diverse urban consumption of aquatic products.

First, the industrial parks pivot on the fusion of agriculture with manufacturing and service sectors through horizontal integration. The value chain spans a wide spectrum of activities, from the production of agricultural or aquatic commodities to their processing, distribution, and marketing, as well as technology franchising and tourism. For instance, in 2015, Shunde announced its plan to construct eight "modern agricultural industrial parks", with Renhai Village as a demonstration area. In Renhai Village, a comprehensive eel industry has been established, covering eel fry cultivation, eel farming, feed production, grilled eel processing, and product export. The export of eels from Shunde, especially to the Japanese market, now accounts for over one-fifth of China's total production and export. In Nanhai, the district government has enacted a diverse array of preferential policies to bolster leading aquaculture corporations to develop Nanhai into a national-level prepackaged food distribution centre. These parks stimulated the increase of intensive farming of high-priced fish. The output of high-priced fish rose to 92.7 % of total production in 2019, up from 59.1 % in 2007 (Guangzhou Institute of Geography, 2021). In addition to fostering the transition towards high-value-added agricultural or aquatic products and services, the agricultural industrial parks serve as catalysts for agro-technological innovation to enhance the market competitiveness of the DPS region. These state-sponsored agricultural industrial parks illuminate the multiscalar contextual approach with the intersection of global market demands, national technological upgrading strategies, and local agro-ecological reconfigurations. The horizontal integration of value chains represents more than economic restructuring - it constitutes a fundamental reconfiguration of human-nonhuman relations amid planetary commodity networks. Advanced breeding techniques, sophisticated processing technologies, and high-value aquatic species have been enrolled in state-led projects of rural modernisation, creating hybrid assemblages that simultaneously perform 'sustainable development' while maintaining the logics of intensive farming.

Second, the state is resorting to the ancient wisdom associated with MDPS. It proposes to reinvigorate MDPS by promoting zero-emission aquaculture models, optimising resource utilisation, and meeting emission standards for aquaculture wastewater. It is believed that leading firms with advanced technology are able to achieve this objective. By the end of 2020, the Foshan government and the leading agricultural company Heshi Aquaculture had jointly declared the successful accomplishment of the Hundred Acres Aquaculture Pond Renovation project. The project utilised a variety of purification media, including aquatic plants, crushed stones, fine sand, ceramic particles, palm fronds, and aeration and oxygenation technology to improve water quality. This enables the fishponds to meet discharge standards or to recycle water, thereby improving the aquatic environment and enhancing the quality of products. Each pond covers approximately 1.7 acres and has two tailwater treatment systems, including facilities such as sedimentation ponds, filtration dams, aeration ponds, and biological purification ponds (Guangzhou Institute of Geography, 2021). Nevertheless, this model is difficult to extend to smallholders due to the high investment costs and technological barriers (Interview with a fish farmer, May 2023).

This technological trajectory reveals how variegated planetary ruralities emerge through the negotiation between environmental imperatives and capital accumulation, in line with the multiscalar contextual framework. While advanced purification technologies and renewable energy integration represent genuine attempts to address the metabolic rifts generated by intensive aquaculture, they have also created new forms of exclusion that favour large corporations over smallholders. Agency of purification media, technological systems, and engineered aquatic environments demonstrates how more-than-human networks become mobilised within ecological modernisation projects, yet their high-tech requirements simultaneously reproduce rural inequalities at local scales.

6.2. State-led rural tourism initiatives

The emergence of state-led rural tourism initiatives exemplifies the multiscalar contextual approach with interplays between global heritage conservation discourses, national cultural revival policies, and local place-making practices involving more-than-human performances. At the global scale, UNESCO recognition and international sustainable tourism paradigms provide legitimacy for heritage conservation. At the national level, the state deploys rural cultural heritage as a tool for achieving both economic diversification and cultural conservation. At the local scale, the local state has invested in rural tourism infrastructure and provided policy support and financial assistance to develop and promote rural leisure based on the MDPS. As such, the local state responds to the national initiatives of ecological civilisation and rural revitalisation, fostering new economic growth drives and preserving agricultural cultural heritage in the rural areas.

State-led initiatives have strategically capitalised on the intricate interconnections of diverse components within traditional MDPS landscapes, underscoring the symbiotic relationship between human development and natural resource utilisation. The area spanning contiguously across the territories of Qixing, Ruxi, and Xianggang Villages of Nanhai District, which is nestled at the foot of the illustrious Xiqiao Mountain in South Guangdong, envelops an impressively vast and uninterrupted stretch of 1811.7 acres of MDPS. In 1972, Qixing Village in Xiqiao Town garnered recognition from the UNESCO as a core MDPS farmland demonstration area for maintaining over 493 acres of extensive fishponds to this day. Also, approximately one-third of the total area in Ruxi Village is dedicated to dike-pond farming. A prime example is the establishment of Yugeng Yueyun Cultural Tourism Park (YYCT Park) at the centre of the aforementioned MDPS area. In 2014, the government embarked on a journey of aquatic ecological landscape rehabilitation within the region, with an intent to meticulously recreate and resurrect the traditional MDPS landscapes. Because of these efforts, the Foshan DPS was incorporated into China's Important Agricultural Cultural Heritage List in 2019. The YYCT Park, with a planned total area of 320.22 ha, functions as a spatial and material embodiment of the ancient MDPS. More than 20,000 mulberry trees have been planted inside the park.

By replacing pollution-intensive aquatic farming through revitalised MDPS tourism projects, the state attempts to facilitate integrated urban-rural development and the convergence of agriculture with secondary and tertiary industries (Interview with three village heads, September 2021). Local officials contend that this not only maintains the economic benefits of ponds but also mitigates environmental pollution of intensive aquatic farming and the negative impacts of land degradation caused by the declining ecological functions of the MDPS (Focus interviews with Agriculture Departments of Nanhai and Shunde, October 2022). Within the YYCT park, the local state rejuvenated the traditional picturesque water town scenery of the MDPS region and restored the symbiotic ecological circulations emblematic of MDPS. Ancient MDPS ecology is recreated to showcase local cultures and re-establish positive ecological agricultural or circular economic models promoting sustainable development.

In effect, the park has metamorphosed into a cultural tourism resort complex, largely devoid of real agricultural production. The park offers a rich array of participatory rural tourism activities that allow visitors to immerse themselves in traditional agricultural practices and rural life. These experiences range from hands-on activities such as mulberry picking and processing, silkworm rearing, and traditional textile processing to rural entertainment games and pottery works. Conventional agricultural activities, including duck and pig herding, fishing, and grinding tofu, have gained considerable popularity among urban visitors. For children, the park offers unique experiences like adopting young silkworms. The state also strategically employs the park as a base for pedagogical initiatives, such as natural and environmental education and knowledge dissemination in regard to ecology, culture, and geography. By orchestrating research and experiential learning activities, the park is transformed into an immersive outdoor classroom for public school students, catering to a broad spectrum of age groups within primary to secondary education. In addition, visitors can enjoy family picnics and take boat rides that exemplify a water town nostalgia. Besides, the YYCT park management committee routinely organises a Fishing Festival, during which thousands of live fish are released into the pond for visitors to catch, drawing thousands of participants daily throughout the event. Within the fishing area, individuals can re-immerse themselves in historical rural production, in forms as diverse as catching fish with their bare hands or employing fishing baskets and nets, aiding in fish transport, feeding tiddlers with nursing bottles, interacting with ornamental fish, and indulging in fish pedicures.

Here, the agencies of silkworms, fish, mulberry trees, and traditions jointly create a rural assemblage that is both materially tangible and symbolically constructed. This represents a distinctive form of planetary rurality that transcends simple rural-urban binaries by creating hybrid spaces where urban bodies temporarily inhabit rural practices, mediated through carefully orchestrated more-than-human encounters.

The transformation of MDPS's socio-ecological functions bears witness to the evolving cultural significance of the MDPS throughout history. In the past, MDPS production constituted a highly laborious activity (Multiple interviews with aquatic farmers, 2019–2023). However, it has now transitioned into an experiential tourism venture, enabling individuals to temporarily escape the pressures and anxieties of urban work and relish leisure. Nonetheless, as Cloke (2006, 19) argues, "such developments cannot simply be dismissed as a colonising commodification of rural nature into urban forms, as the very presence of pseudo-rural landscapes, creatures and practices opens out imaginative spaces of the rural in these hybrid settings." This perspective suggests that blending urban and rural elements in spaces such as the YYCT Park generates new opportunities for understanding and appreciating the complexities of rural-urban relationships and their ongoing transformations. The park serves as a site of cultural negotiation, where urban dwellers can engage with rural traditions and practices in ways that challenge and reconfigure conventional boundaries between nature and culture, tradition and modernity, and rural and urban life.

In sum, this analysis demonstrates how the 'upgraded and romanticised' rurality in the era of ecological civilisation emerges through the dynamic intersection of multiscalar political-economic forces and strategic deployments of more-than-human agencies. The twin modalities of ecological modernisation and cultural nostalgia operate across multiple scales, including global sustainability imperatives, national policies, and local socio-ecological reconfigurations. Crucially, these transformations are enacted with the active participation of diverse non-human actors - from genetically modified fish species, to advanced purification technologies in industrial parks, and to recreated ecosystems and performative heritage practices in tourism sites. The resulting rurality represents neither a return to traditional practices nor a complete subsumption under urban logics, but rather a hybrid assemblage that embodies the contradictions and possibilities of China's contemporary development ethos. This new form of planetary rurality reveals how state-orchestrated sustainability projects simultaneously enable new modes of rural growth while generating new exclusions and dependencies.

7. Conclusion

Overall, the multiscalar contextual approach we propose in this paper makes three distinct contributions to planetary/relational rural geographies. First, it moves beyond existing binary debates between planetary urbanisation and planetary ruralisation by demonstrating how planetary ruralisation becomes a historical-geographically variegated process through the dynamic intersection of political-economic forces and more-than-human networks operating across multiple scales. Second, it addresses the under-theorised role of more-than-human agencies

in planetary rural transformations by showing how nonhuman actors – e.g. from silkworms and fish to heavy metals and technologies - actively participate in rurality's ongoing (re)constitution rather than merely serving as passive resources or backdrops. Finally, it provides an analytical framework that avoids both romanticising rural sustainability and dismissing rural agency, instead revealing how contradictory and paradoxical rural configurations emerge through multiscalar negotiations between political-economic imperatives and more-than-human networks.

Through a longitudinal analysis of China's DPS, we demonstrate that despite exhibiting commonalities with rural areas across other contexts, manifested in shared trajectories of globalisation, neoliberalisation, agricultural commodification, tourism development, etc., this region nonetheless articulates with diverse historical epochs and multiscalar political-economic contexts, exemplifying what Peck, advocates as conjunctural sensibility in regional analysis. Particularly salient are changing relations of economic production across different epochs of global capitalism and the almost ubiquitous and pervasive influence of China's multi-scalar state apparatuses. Our longitudinal analysis showcases how multiscalar contextual dynamics generated the three distinct but interconnected forms of planetary rurality, which reveals that contrary to the ideal of rurality as repositories of global sustainability solutions, rural challenges and malaises are far from uncommon.

The 'green yet colonial' rural configuration (1500s–1900s) reveals how political-economic forces can simultaneously enable ecological sustainability and generate extractive dependencies, putting indigenous silk cultivators' livelihoods in a precarious situation. This paradoxical formation emerged not from inherent rural properties but through the specific multiscalar dynamics of Maritime Silk Road trade networks, Western textile demand, and the metabolic agencies of silkworms, mulberry trees, and aquatic ecosystems. The 'backward' rurality period (1980s-2012) illustrates how state entrepreneurialism creates hybrid rural-industrial assemblages that defy conventional rural-urban categorisations. Here, our approach reveals rurality was discursively rearticulated as 'backwardness' to be eradicated by industrialisation and urbanisation, ushering in a hybrid and even oxymoronic process of 'rural industrialisation' or 'rural urbanisation'. It also showcases how 'rural industrialisation' was materially enacted through the agencies of heavy metals, alien fish species, and intensive farming technologies, hence generating new forms of metabolic rift that exceeded both local boundaries and state control. While fulfilling enormous urban fish demand with rocketing output, accelerated agro-industrialisation disrupted DPS ecologies and unevenly distributed socio-ecological impacts between foreign firms and residents. Also, agro-industrialisation practices, facilitated by the region's extensive hydrological networks have generated diffuse contamination and pollution locally. The contemporary 'upgraded and romanticised' rurality (2012-present) demonstrates how ecological modernisation and cultural nostalgia operate as parallel modalities within sustainability governance, simultaneously creating new exclusions and possibilities for rural places. Through state recalibrations embodied in ecological civilisation and rural revitalisation projects, rurality has been discursively defined and materially practiced, to reinvent the countryside into a critical site of multi-dimensional value generation and sustainable development. Two distinct modalities of rurality, respectively related to ecological modernisation and rural cultural nostalgia, are now propagated through state-sponsored industrial parks and culturally-reoriented rural tourism initiatives.

In parallel, post-humanistic perspectives illuminate that the situated forms of DPS should be conceptualised as temporal-spatially variegated, dynamic assemblages that are constituted through the continuous reconfiguration of heterogeneous elements (Deleuze and Guattari, 1987). In the discursive and material practices of reconfiguring 'backward' rural landscapes into sites of 'modern' agro-industry, the paradigm of large-scale intensive fish farming – which assemble novel aquatic species, contemporary breeding sciences, and sophisticated technologies – emerges as an archetypal model of rural development. This socio-technical assemblage not only reconfigures material spaces but also redefines rurality through performative enactment of agricultural modernity. However, in an era marked by increasingly globalised food supply systems, the temporal-spatial extents of health risks posed by the infusion of toxic substances (e.g. fish antibiotics), have significantly broadened and diffused, resulting in a pervasive 'toxic rurality' beyond the remits of local settlements. Similarly, the nonhuman constitutes an integral dimension in the state's discursive and material practices of reconfiguring DPS in the era of ecological civilisation and rural revitalisation. The rural is re-conceptualised as a locus characterised by sophisticated agro-processing industrialisation, environmental aestheticisation, and harmonious human-nature symbiosis. This emergent rural discursive formation and imaginative reconstitution precipitates a constellation of more-than-human and material practices. State-sponsored ago-industrial parks represents a sophisticated reconfiguration of rural economic landscapes. Large agro-companies' horizontal integration of economic activities transcends conventional agricultural value chains by incorporating advanced manufacturing processes and service-oriented functions into spatially concentrated industrial complexes, thereby recalibrating rural positionality within broader political-economic hierarchies. Likewise, in state-promoted rural tourism, traditional MDPS is resurrected to produce pseudo-rural experiences that provide a transient escape from hectic urban lifestyles. More-than-human rural networks, encompassing plants, fishes, silkworms, etc., become entangled with tourism activities, infrastructure, and urban bodies to perform this rural idyll or imaginary.

Future research could further explore how this multiscalar contextual approach might illuminate rural transformations in other geographical and political-economic contexts, particularly focusing on how different configurations of state power, market forces and more-than-human relations generate distinctive patterns of planetary rural existence, as well as change. This would contribute to a more situated and globally informed planetary/relational theory of rurality that attends to both structural dynamics and the multiscalar networks of material relations.

CRediT authorship contribution statement

Kun Wang: Writing – review & editing, Visualization, Resources, Methodology, Funding acquisition, Data curation, Writing – original draft, Validation, Project administration, Investigation, Formal analysis, Conceptualization. **Junxi Qian:** Writing – review & editing, Validation, Resources, Methodology, Funding acquisition, Writing – original draft, Supervision, Project administration, Investigation, Conceptualization. **Caixia Chen:** Resources, Investigation, Methodology, Data curation. **Hongou Zhang:** Validation, Methodology, Resources, Investigation.

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Declaration of competing interest

The authors declare no conflict of interest with regard to the study on which the current submission is based.

Data availability

The authors are unable or have chosen not to specify which data has been used.

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