

TECHNO-PRAGMATIC GOVERNANCE

RAN XI*

ABSTRACT

Over the past three decades, China's regulatory approach to emerging technologies has undergone a profound transformation, from early inaction during the rise of the internet to rapid, strategic interventions in the era of generative artificial intelligence. This Article traces that evolution, identifying a distinctive mode of techno-pragmatic governance: a state-led but flexible model that emphasizes incrementalism, policy-driven experimentation, and public-private collaboration. Drawing on insights from Science and Technology Studies (STS), this Article argues that the regulatory trajectory is not merely institutional but deeply shaped by *sociotechnical imaginaries*—visions of national progress, economic power, and technological modernity coproduced by state and corporate actors. While this model has enabled swift regulatory responses and positioned China as a global leader in areas like AI and electric vehicles, it also comes with costs. This Article reveals how dominant narratives of innovation can marginalize alternative imaginaries—those grounded in public concerns about safety, equity, and justice—and render participatory governance superficial. Through a case study of autonomous vehicles, it critiques the risks of a governance regime overly centered on control and growth, and calls for a shift toward more inclusive, participatory regulatory frameworks. In doing so, it contributes both a theoretical account of China's emerging technologies governance and a normative argument for stakeholder empowerment in global technology regulation.

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INTRODUCTION

In the early 1990s, when the internet began to flourish in China, the state regulators remained largely silent, despite the novel and uncertain implications of the technology. By 1996, only a single law addressed internet activities, and the Ministry of Information Industry stood as the solitary sentinel responsible for all communications to and from the World Wide Web.¹ Fast forward more than two decades, when ChatGPT seized global attention in 2022, China moved with remarkable swiftness. It was one of the first nations to introduce regulatory measures on generative artificial intelligence (AI),² and shortly before, it issued one of the world's earliest regulations on deepfakes.³ By then, a dense web of laws and policies had taken shape, stretching from Beijing to municipal cities, as various administrative agencies sought to channel the momentum of AI toward politically tenable and economically productive ends.⁴

This transformation was not merely one of speed. It was also one of philosophy. In the closing years of the twentieth century, China took a reactive approach to innovation.⁵ Like its neighbors South Korea and Japan, it primarily adopted a market-driven posture, dependent on imported technologies and largely disinterested in the competitive advantages brought by intellectual property.⁶ Innovation, though useful, was not yet strategic. However, this stance changed with the arrival of the new century, and innovation was reimaged as the cornerstone of national

¹ J. Mike Rayburn & Craig Conrad, *China's Internet Structure: Problems and Control Measures*, 21 INT'L J. MGMT. 471, 472 (2004).

² Jian Xu, *Opening the 'Black Box' of Algorithms: Regulation of Algorithms in China*, 10 COMMC'N RSCH. & PRAC. 288, 294 (2024); Nitika Sharma, *China Releases Strong Guidelines for Use of AI in Research*, ANALYTICS VIDHYA (Jan. 5, 2024), <https://www.analyticsvidhya.com/blog/2024/01/china-releases-strong-guidelines-for-use-of-ai-in-research/> [<https://perma.cc/VW6P-VR8G>].

³ *China Regulates Deepfake Technology*, ENG'G & TECH. (Oct. 8, 2023), <https://eandt.theiet.org/2023/01/11/china-regulates-deepfake-technology> [<https://perma.cc/2CCE-43B9>]; *China's Deepfake Regulations: Navigating Security, Misinformation and Innovation*, UNIV. OXFORD, <https://www.ox.ac.uk/event/chinas-deepfake-regulations-navigating-security-misinformation-and-innovation> [<https://perma.cc/NV6M-3QLZ>] (last visited July 22, 2025).

⁴ See *infra* Part II.A.

⁵ See Chen Ling & Barry Naughton, *An Institutionalized Policy-Making Mechanism: China's Return to Techno-Industrial Policy*, 45 RSCH. POL'Y 2138, 2138 (2016) (discussing the Chinese government's intervention in its technology development).

⁶ Cong Cao, Richard P. Suttmeier & Denis Fred Simon, *China's China's 15-Year Science and Technology Plan*, 59 PHYSICS TODAY 38, 39 (2006); Sang-Hyun Kim, *Social Movements and Contested Sociotechnical Imaginaries in South Korea*, in DREAMSCAPES OF MODERNITY: SOCIOTECHNICAL IMAGINARIES AND THE FABRICATION OF POWER 152, 154 (Sheila Jasanoff & Sang-Hyun Kim eds., 2015).

development.⁷ In 2006, the state launched its Medium and Long Term Program for the Development of Science and Technology (MLP), a national strategy that set the ambitious goal of making China a world leader in science by 2050.⁸ From that moment forward, innovation was no longer a passive outcome of market forces; it was a national imperative.⁹ This shift turns out to be productive. In electric vehicles (EVs) alone, by 2020, Chinese entities held nearly 27 percent of global EV patents, up from a negligible 2.4 percent in 2010.¹⁰

As the national blueprint changed, so too did the tools and modes of governance. Where once regulation relied almost exclusively on command and control, it now speaks the language of collaboration. “Collaborative governance” appears with frequency in the laws of emerging technologies.¹¹ The state remains central, but private actors are assuming an increasingly prominent role in the regulatory process.¹² Tech giants like Baidu, Tencent, Alibaba, and Huawei are both regulatees and regulators, subject to state scrutiny but deeply involved in shaping the very policies they are meant to obey.¹³ Their executives, many of them delegates to the government, do not merely implement administrative directives; they help orchestrate them.¹⁴ Meanwhile, the regulatory toolkit has expanded. Alongside hard law, a spectrum of soft law instruments have come into play, ranging from regulatory sandboxes, guidance opinions, and technical standards to policies that advocate rather than

⁷ See *infra* Part I.A.

⁸ Cao, Suttmeier & Simon, *supra* note 6, at 38.

⁹ See Xinhua, *China to Continue Innovation-Driven Development Strategy*, CHINA DAILY (Dec. 21, 2015, at 20:58 CT), https://www.chinadaily.com.cn/china//2015-12/21/content_22766992.htm [<https://perma.cc/DYS5-KRE5>] (including a statement from the Central Economic Work Conference, “Reform and innovation will inspire creativity and new growth engines while facilitating upgrading in traditional industries and growth in emerging ones.”).

¹⁰ Stephen Ezell, *How Innovative Is China in the Electric Vehicle and Battery Industries?*, INFO. TECH. & INNOVATION FOUND. (July 29, 2024), <https://itif.org/publications/2024/07/29/how-innovative-is-china-in-the-electric-vehicle-and-battery-industries/> [<https://perma.cc/B5QJ-Y6VT>].

¹¹ Jamie P. Horsley, a Chinese policy expert, defines China’s “collaborative governance” (*xietong zhili*) as the governance model that encourages government “to collaborate with industry associations, platform companies, resource providers, and consumers to address issues that arise from” the digital economy. Jamie P. Horsley, *Background: Regulatory Challenges of China’s Evolving Sharing Economy*, YALE L. SCH. (Apr. 24, 2018), https://law.yale.edu/sites/default/files/area/center/china/horsley_sharing_economy_regulatory_background_april_2018.pdf [<https://perma.cc/7FCE-E9JB>].

¹² See *infra* Part II.C.

¹³ See *infra* Part II.C.1.

¹⁴ See *infra* notes 184–87 and accompanying text.

compel.¹⁵ These non-binding laws aim at fostering innovation with a series of incentives and modeling the development of new technologies in line with the telos of China's broader technology blueprints. Viewed in isolation, these shifts may seem dramatic, but traced across three decades, they have become part of the regulatory routine.¹⁶

These developments give rise to deeper questions: What underlying forces have shaped the evolution of China's regulatory landscape of emerging technologies over the past three decades? How has the state's shifting vision of technology influenced its policy choices? In recent years, international observers have begun to scrutinize China's approach to AI, particularly within the broader context of intensifying US–China technological rivalry.¹⁷ And yet, the deeper regulatory traditions underpinning China's governance of new technologies remain curiously underexamined by scholars, lawyers, and policymakers alike.¹⁸ What forces molded the government's stance on technologies like the internet and blockchain—and what, if anything, might those early patterns tell us about how AI will be governed?

This Article begins with a look backward, tracing the origins of China's approach to regulating emerging technologies. It considers the government's early engagement with the internet and later, with blockchain, to outline a regulatory logic that has gradually taken shape. A throughline is what Chinese scholars have termed *developmental pragmatism*, a philosophy undergirding the state's flexible and purposeful

¹⁵ See *infra* Part I.C.

¹⁶ See *infra* Part I.C.1.

¹⁷ Cf. Matt Sheehan, *China's AI Regulations and How They Get Made*, CARNEGIE ENDOWMENT FOR INT'L PEACE (July 10, 2023), <https://carnegieendowment.org/research/2023/07/chinas-ai-regulations-and-how-they-get-made> [<https://perma.cc/SBT2-YRCE>] (discussing the interplay between China's ministries and agencies in developing AI regulation); Karman Lucero, *Artificial Intelligence Regulation and China's Future*, 33 COLUM. J. ASIAN L. 94 (2019) (discussing the political versus substantive goals in China's AI policy); Angela Huyue Zhang, *The Promise and Perils of China's Regulation of Artificial Intelligence*, 63 COLUM. J. TRANSNAT'L L. 1 (2025) (discussing how China's AI regulation offers a competitive advantage for A.I. firms while offering little protection for the Chinese public); see generally ANU BRADFORD, *DIGITAL EMPIRES: THE GLOBAL BATTLE TO REGULATE TECHNOLOGY* (2023) (discussing how China's regulatory models on tech companies may collide with the international domain); JEFFREY DING, *TECHNOLOGY AND THE RISE OF GREAT POWERS: HOW DIFFUSION SHAPES ECONOMIC COMPETITION* (2024) (discussing the US-China competition in AI).

¹⁸ Cf. Matt Sheehan, *Tracing the Roots of China's AI Regulations*, CARNEGIE ENDOWMENT FOR INT'L PEACE (Feb. 27, 2024), <https://carnegieendowment.org/russia-eurasia/research/2024/02/tracing-the-roots-of-chinas-ai-regulations> [<https://perma.cc/5CQC-YKE6>] (“This paper is the second in a series breaking down China's AI regulations and pulling back the curtain on the policymaking process shaping them.”).

internet regulation.¹⁹ Chinese regulators have long embraced “incremental, context-specific solutions,” allowing space for legal ambiguity, when necessary,²⁰ all while remaining anchored to national priorities. Over time, this form of pragmatism, tethered to a broader belief in technological progress, has solidified into a mode of governance that balances flexibility with control. I call this *techno-pragmatic governance*. Against this backdrop, the state’s expansive regulatory posture toward AI unfolds not as rupture, but as continuity.

To better understand how emerging technologies regulation or the lack thereof comes into being in China, this Article turns to insights from Science and Technology Studies (STS). From this vantage, technology is seen as socially constructed.²¹ A technological artifact, such as the autonomous vehicle (AV), is interpretively flexible and shaped by multiple social groups, including regulators, industry players, and users.²² Each group projects their expectations and values onto the design and deployment of it. As Sheila Jasanoff has observed, technologies do more than serve practical ends; they encode aspirations, fears, and visions of what the future ought to be.²³ They are, in short, instruments with which modern societies imagine and enact the world to come.

Technological choices are inherently political,²⁴ and the regulation of technology, whether top-down or bottom-up, inevitably reflects the normative imaginaries of those involved. STS, now a well-established interdisciplinary field, offers a framework for unpacking these dynamics.²⁵ In the context of China, it encourages us to look beyond a formalistic study of regulation and attend instead to the subtle currents that run through the state’s technology governance: the hopes and anxieties

¹⁹ Zhang Zhian (张志安) & Ran Zhen (冉 桢), Fazhan Shiyong Zhuyi: Zhongguo Hulanwang Zhengce Bianqian yu Pingtai Zhili de Neizailuoji (发展实用主义：中国互联网政策变迁与平台治理的内在逻辑) [Development Pragmatism: The Evolution of China’s Internet Policy and the Inner Logic of Platform Governance], XINWEN YU XIEZUO [NEWS & WRITING] 89, 93 (2023) (China); Cai Cuihong & Dai Liting, *Evolution of Internet Governance in China: Actors and Paradigms*, 7 CHINA Q. INT’L STRATEGIC STUD. 79, 101 (2021).

²⁰ Samuli Seppänen, *Chinese Legal Development Assistance: Which Rule of Law? Whose Pragmatism?*, 51 VAND. J. TRANSNAT’L L. 101, 106 (2018).

²¹ See *infra* notes 44–48 and accompanying text.

²² Neil F. Doherty, Crispin R. Coombs & John Loan-Clarke, *A Re-Conceptualization of the Interpretive Flexibility of Information Technologies: Redressing the Balance Between the Social and the Technical*, 15 EUR. J. INFO. SYS. 569, 571 (2006); SHEILA JASANOFF, *DESIGNS ON NATURE: SCIENCE AND DEMOCRACY IN EUROPE AND UNITED STATES* 207 (2005).

²³ JASANOFF, *supra* note 22, at 251.

²⁴ *Id.* at 205–06.

²⁵ Frank Pasquale & Arthur J. Cockfield, *Beyond Instrumentalism: A Substantivist Perspective on Law, Technology, and the Digital Persona*, 2018 MICH. ST. L. REV. 821, 824 (2018).

projected onto technological artifacts, the uneasy balancing between state control and market ambitions, the values embedded in seemingly neutral code, and how, through permeating institutional process, these visions take on material force. As this Article reveals, technology regulation has become a driving engine for economic growth and an act of coproduction, one in which laws and technologies are shaped in tandem, and where private enterprises and public authorities converge to author a technocratic future.²⁶ In this light, China's AI governance, like its earlier efforts with the internet and blockchain, offers a vivid instantiation of state imaginaries made manifest.²⁷

It is also through the lens of the STS that this Article interrogates what is systematically missing from China's techno-pragmatic governance. Technology carries with it *sociotechnical imaginaries*: "collectively imagined forms of social life and social order reflected in the design and fulfillment of nation-specific scientific and/or technological projects."²⁸ In this process, legal and regulatory frameworks play a dual role. On the one hand, actors with discursive power, namely governments and large corporations, actively shape how we perceive a given technology. These dominant imaginaries, constructed through corporate messaging and state-led initiatives, portray technologies such as AVs as symbols of convenience, efficiency, modernity, and innovation.²⁹ On the other hand, the sociotechnological imaginaries are not merely passive reflections; they feed back into the development and governance of technology itself.³⁰ They influence what is designed, built, and deployed, and what becomes technically feasible and politically desirable.³¹ Firms may capitalize on public confidence and anticipation to design increasingly "automated" artifacts that project the image of innovation,³² while governments may expedite deployment in the name of economic growth and infrastructural modernization.³³

²⁶ See *infra* Part II.C.

²⁷ See *infra* Part II.

²⁸ Sheila Jasanoff & Sang-Hyun Kim, *Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea*, 47 MINERVA 119, 120 (2009).

²⁹ See *infra* Part III.A.

³⁰ See Sheila Jasanoff & Sang-Hyun Kim, *Sociotechnical Imaginaries and National Energy Policies*, 22 SCI. AS CULTURE 189, 189–90 (2013).

³¹ See *id.*

³² GILBERT SIMONDON, ON THE MODE OF EXISTENCE OF TECHNICAL OBJECTS (Cecile Malaspina & John Rogove trans., Univocal Publishing 2017) (1958).

³³ See *infra* Part III.A.

However, it is crucial to recognize that sociotechnological imaginaries do not equate to the inherent nature of a technology.³⁴ Imaginaries are plural, often contested, and deeply shaped by power asymmetries.³⁵ Alongside the dominant visions driven by corporate and state interests, there exist alternative imaginaries grounded in public expectations for equity, safety, and justice.³⁶ These perspectives, however, are frequently marginalized—dismissed as obstacles to innovation, impediments to economic advancement, or even threats to state authority.³⁷ In this way, the advancement of emerging technologies can become a rabbit hole—propelled by selective visions of progress, while systematically overlooking risks and silencing the very public who must live with these consequences. Moreover, as Julie E. Cohen cautions, “innovation does not follow an inevitable, linear arc to a predetermined end.”³⁸ It is often the concerns underlying these sidelined imaginaries that open richer and more inclusive pathways for innovation.

To redress this imbalance, the Article proposes a reorientation from governance that merely tolerates participation to one that actively empowers it.³⁹ Stakeholder inclusion should not be treated as an afterthought or a procedural formality, but rather as a foundational condition for regulation that is just, adaptive, and genuinely responsive to the complexities of technological life.⁴⁰ The Article also discusses the role

³⁴ SIMONDON, *supra* note 32 (“the technical object is known through social myths or fads in public opinion, rather than being appreciated in itself”).

³⁵ Astrid Mager & Christian Katzenbach, *Future Imaginaries in the Making and Governing of Digital Technology: Multiple, Contested, Commodified*, 23 *NEW MEDIA & SOC’Y* 223, 226–27 (2021).

³⁶ See *infra* Part III.

³⁷ See Huw Roberts, Josh Cowls, Emmie Hine, Jessica Morley, Vincent Wang & Mariarosaria Taddeo, *Governing Artificial Intelligence in China and the European Union: Comparing Aims and Promoting Ethical Outcomes*, 39 *INFO. SOC’Y* 79, 86 (2023) (noting that in China, AI is primarily framed in terms of its potential to enhance national competitiveness, economic growth, and societal advancement, while individual rights are seldom positioned as a central concern).

³⁸ Julie E. Cohen, *What Privacy is For*, 126 *HARV. L. REV.* 1904, 1919 (2013).

³⁹ See *infra* Part III.B.

⁴⁰ Orly Lobel, *The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought*, 89 *MINN. L. REV.* 342, 374 (2004) (“[T]he overall goal of participation is broader than simply ensuring the achievement of policy goals; it enhances the ability of citizens to participate in political and civic life.”); Frank Fischer, *Participatory Governance: From Theory to Practice*, in *THE OXFORD HANDBOOK OF GOVERNANCE* 457, 457–58 (David Levi-Faur ed., 2012); see also Julia Black, *Decentering Regulation: Understanding the Role of Regulation and Self-Regulation in a ‘Post-Regulatory’ World*, 54 *CURRENT LEGAL PROBS.* 103, 109–10 (2001) (explaining that the relationship between regulator and regulatee exists and should be viewed as mutually dependent with their own needs and capacities).

of e-participatory tools—instruments of control that might also become instruments of empowerment.⁴¹

This Article proceeds as follows. Part I traces the evolution of China's regulatory approach to emerging technologies by highlighting its priorities, trade-offs, and development trajectories. It examines how the state's techno-pragmatic stance, characterized by regulatory agility and policy-driven experimentation, manifested in early interventions around the Internet and blockchain. At the same time, it foreshadows the risks of state-led innovation and the exclusion of key stakeholders. Part II shifts focus to China's regulation of AI, which both continues and evolves from its earlier approaches. Grounded in pragmatism, AI governance exhibits increasingly value-laden dimensions, particularly regarding social stability and economic competitiveness. Viewed through the lens of STS, this Part examines how the governance of AI is shaped not only by law and policy but also by coproduced imaginaries between the state and technology giants, institutionalized through standards, initiatives, and technical protocols. New governance models, such as self-regulation and collaborative governance, have emerged, but they remain shaped by asymmetrical power dynamics. Part III critiques the costs and risks of this governance model. Drawing on a case study of AV accidents and failures, it illustrates how dominant imaginaries that are centered on control, innovation, and economic growth can suppress alternative priorities, invite manipulation, and ultimately erode public trust. It advocates more inclusive and participatory governance models supported by e-participatory tools designed to empower marginalized actors.

Notably, the difficulties observed in China's techno-pragmatic governance, for all their particularities, are far from unique; they resonate with variations across many of the world's leading jurisdictions.⁴² Then,

⁴¹ See *infra* Part III.C.

⁴² See generally Michele Estrin Gilman, *Beyond Window Dressing: Public Participation for Marginalized Communities in the Datafied Society*, 91 *FORDHAM L. REV.* 503, 508 (2022) (discussing the difficulties in techno-pragmatic governance in the United States); Daryl Lim, *Determinants of Socially Responsible AI Governance*, 25 *DUKE L. & TECH. REV.* 183, 220–31 (2025) (exploring the difficulties across jurisdictions from the European Union, United States, China, and Singapore); Igor Calzada, *Artificial Intelligence for Social Innovation: Beyond the Noise of Algorithms and Datafication*, 16 *SUSTAINABILITY* 8638, at 2 (2024) (exploring how AI has shaped the Global North and South); Gianluca Iazzolino & Nicole Stremlau, *AI For Social Good and the Corporate Capture of Global Development*, 30 *INFO. TECH. DEV.* 626, 632–33 (2024) (discussing how the United Nations attempts to regulate different tech industries using AI); Christopher Wilson, *Public Engagement and AI: A Values Analysis of National Strategies*, 39 *GOV'T INFO. Q.* 1, 2 (2022) (discussing AI governance and its difficulties with “articulation” and “dissemination”).

China's experience, and the lessons drawn from it, illuminate the broader, unfinished task of governing technologies that outpace the institutions meant to contain them.

I. A DEVELOPMENTAL PRAGMATIST APPROACH TO EMERGING TECHNOLOGIES

When regulators around the world craft laws for emerging technologies, they face a common dilemma: how to promote innovation while managing risks and safeguarding societal values.⁴³ Chinese regulators are no exception. However, the balancing act may be even more delicate in China, given its vast population, rapid development, and dual imperatives of economic growth and social stability. Over time, China has forged a distinctive model of internet regulation that Chinese scholars describe as *developmental pragmatism*.⁴⁴ This Part examines this model not through a linear historical narrative, but by analyzing its key governing features and how they have evolved over time. It first explores the enduring tension between control and innovation in China's technology governance and traces how this dual imperative first emerged in China's Internet governance and gradually crystallized into a distinctive regulatory philosophy. It then focuses on the state's turn toward agile regulation as a means of shaping technological trajectories at early stages. Finally, this Part analyzes the central role of policy instruments as flexible, quasi-regulatory tools that stabilize sociotechnical order in advance of formal legislation.

A. NAVIGATING CONTROL AND INNOVATION

As early as the 1980s, scholars in the STS recognized that technology is not neutral but possesses inherently political attributes.⁴⁵ At the time, this idea was considered "provocative" because it challenged

⁴³ Lyria Bennett Moses, *How to Think About Law, Regulation and Technology: Problems With 'Technology' as a Regulatory Target*, 5 L. INNOVATION & TECH. 1, 7–8 (2013) (citing Marjolein van Asselt, Ellen Voss & Tessa Fox, *Regulating Technologies and the Uncertainty Paradox*, in DIMENSIONS OF TECHNOLOGY REGULATION 259 (Goodwin, Koops & Leenes eds., 2010)) (discussing the "uncertainty paradox" facing the technology regulators); Jonathan Lewallen, *Emerging Technologies and Problem Definition Uncertainty: The Case of Cybersecurity*, 15 REGUL. & GOVERNANCE 1035, 1036 (2021); David E. Pozen, *Privacy-Privacy Tradeoffs*, 83 U. CHI. L. REV. 221, 221 (2016) (noting the balancing between privacy and innovation).

⁴⁴ Zhang & Ran, *supra* note 19, at 93.

⁴⁵ Langdon Winner, *Do Artifacts Have Politics?*, 109 DAEDALUS 121, 121 (1980).

conventional understandings by asserting that technological artifacts could be evaluated according to the specific forms of power and authority they embody.⁴⁶ Later, technology constructivism developed this insight, positing that technology should be understood “as the outcome of coordinated human action and hence as inherently social.”⁴⁷ Technological artifacts are thus believed to be interpretively flexible, allowing various social groups, including state regulators, to shape both the design and utility of a particular technology.⁴⁸ This interpretive flexibility underscores the dynamic interaction between technology and politics, where emerging technologies are not only objects of regulation but also active arenas of contestation, negotiation, and geopolitical competition.⁴⁹

However, more than thirty years ago, Chinese authorities did not fully recognize the techno-political dimension of technology. In fact, when the internet emerged in China in the early 1990s, the Chinese government was slow to respond to this behemoth, both in asserting control over it and in shaping its development. Despite the state’s initial reticence, the internet experienced rapid and widespread growth. By 2005, over one hundred million Chinese users were online, engaging with countless blogs, chatrooms, and commercial sites.⁵⁰ Much like AI today, the internet then introduced complex economic, social, cultural, and ethical challenges, ranging from email scams and computer crimes to online copyright infringement and invasion of privacy, demanding intervention from the state.⁵¹ In response, the Chinese government began enacting a series of

⁴⁶ *Id.*; Sheila Jasanoff, *The Idiom of Co-production*, in STATES OF KNOWLEDGE: THE CO-PRODUCTION OF SCIENCE AND SOCIAL ORDER 3 (Sheila Jasanoff ed., 2004) (“[Scientific knowledge] ... both embeds and is embedded in social practices, identities, norms, conventions, discourses, instruments and institutions – in short, in all the building blocks of what we term the social.”).

⁴⁷ Wanda J. Orlikowski, *The Duality of Technology: Rethinking the Concept of Technology in Organizations*, 3 ORG. SCI. 398, 403 (1992).

⁴⁸ Doherty, Coombs & Loan-Clarke, *supra* note 22, at 571.

⁴⁹ See Mathew Burrows et al., *Unpacking the Geopolitics of Technology: How Second- and Third-Order Implications of Emerging Tech are Changing the World*, ATL. COUNCIL (2021), at 5, https://www.atlanticcouncil.org/wp-content/uploads/2021/12/GTC_Unpacking-the-Geopolitics-of-Technology.pdf [<https://perma.cc/NKS5-VJB3>].

⁵⁰ See Eric Harwit & Duncan Clark, *Shaping the Internet in China. Evolution of Political Content Over Network Infrastructure and Content*, 41 ASIAN SURV. 377, 377 (2001); Trina K. Kissel, *License to Blog: Internet Regulation in the People’s Republic of China*, 17 IND. INT’L & COMPAR. L. REV. 229, 229 (2007).

⁵¹ See generally Anna Granova & JHP Eloff, *A Legal Overview of Phishing*, COMPUT. FRAUD & SEC., July 2005, at 6–7 (discussing email scams); IAN J. LLOYD, *INFORMATION TECHNOLOGY LAW* 212–17 (2011) (discussing various forms of cyber fraud, hacking, and other computer-related crimes); Jerry Kang, *Information Privacy in Cyberspace Transactions*, 50 STAN. L. REV. 1193,

regulations in the early 2000s to address these legal risks—its first encounter with the complex challenge of balancing innovation and control in the governance of emerging technologies.

Above all, control has always been a top priority for China.⁵² The state has always prioritized social harmony and stability, viewing the internet's decentralized network architecture as a potential source of unrest.⁵³ Unregulated information flow is also seen as a potential threat to the state's national security.⁵⁴ Out of these concerns, China has constructed one of the most sophisticated firewalls in the world, selectively blocking and filtering online content.⁵⁵ Technologies from American companies like Cisco were repurposed to regulate internet traffic effectively without compromising system performance.⁵⁶ The state also imposed duties and obligations on different stakeholders to support the control: online users were required to register their devices, internet cafés were mandated to install content-filtering software,⁵⁷ and Internet Service Providers were licensed, monitored, and held accountable under strict codes of conduct.⁵⁸ Through these measures, the state established a tripartite legal framework for internet governance, imposing civil, criminal, and administrative liabilities on various stakeholders, from individuals and private companies to state-owned enterprises.⁵⁹ Over the

1198–99 (2001) (discussing information privacy in the digital age); Trotter Hardy, *Property (and Copyright) in Cyberspace*, 1996 U. CHI. LEGAL F. 217, 236–58 (1996) (discussing the protection of informational works in cyberspace); David R. Johnson & David Post, *Law and Borders—The Rise of Law in Cyberspace*, 48 STAN. L. REV. 1367 (1996) (arguing that cyberspace, different from the traditional physical space, requires a system of new rules).

⁵² Benjamin L. Liebman, *Watchdog or Demagogue? The Media in the Chinese Legal System*, 105 COLUM. L. REV. 1, 14–15 (2005).

⁵³ YOCHAI BENKLER, *THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM* 266–68 (2006) (examining how the internet raises the cost and reduces the effectiveness of information control, making it more challenging to regulate than traditional mass media).

⁵⁴ Shaun Breslin & Simon Shen, *Online Chinese Nationalism*, CHATMAN HOUSE, Sep. 2010, at 5–6, https://www.chathamhouse.org/sites/default/files/public/Research/Asia/0910breslin_shen.pdf [<https://perma.cc/G2RN-KDRW>].

⁵⁵ ANDREW D. MURRAY, *THE REGULATION OF CYBERSPACE: CONTROL IN THE ONLINE ENVIRONMENT* 47–48 (2007); JACK GOLDSMITH & TIM WU, *WHO CONTROLS THE INTERNET?: ILLUSIONS OF A BORDERLESS WORLD* 92 (2006).

⁵⁶ *Id.* at 93–94. Chinese internet carriers used equipment from Cisco, a Silicon Valley network vendor, to effectively restrict internet traffic while minimizing any substantial impact on system performance.

⁵⁷ BENKLER, *supra* note 53, at 267–68.

⁵⁸ *Id.*

⁵⁹ *See, e.g.*, Guanyu Weihu Hulianwang Anquan de Jueding (关于维护互联网安全的决定) [Decision on Maintaining Internet Security] (promulgated by the Standing Comm. Nat'l People's Cong., Dec. 28, 2000), 2001 STANDING COMM. NAT'L PEOPLE'S CONG. GAZ.,

following two decades, the state steadily tightened its grip on the internet, stepping up regulatory efforts by enacting a range of laws and policies, spanning areas such as cybersecurity, content moderation, e-commerce, and the platform economy.⁶⁰

While control is paramount, Chinese regulators, keenly aware of the internet's potential, have been cautious not to stifle its growth.⁶¹ However, prior to the twenty-first century, innovation did not occupy a prominent place in the state's regulatory outlook. At the time, China followed a market-driven strategy that relied heavily on foreign technologies.⁶² This strategy helped increase access to multinational corporations and expanded market opportunities but offered limited returns in terms of fostering innovation. The country was dependent on intellectual property overseas and made modest advances in developing its own patent infrastructure.⁶³ Gradually, policymakers began to reassess this trajectory. Influenced in part by Schumpeterian ideas that cast innovation as a driver of economic development,⁶⁴ Chinese regulators came to realize that technological advancement could serve as both a competitive advantage and a catalyst for catching up in the global economy.⁶⁵ A

https://www.gov.cn/gongbao/content/2001/content_61258.htm [https://perma.cc/RML3-FVNP] (China). The *Decision on Maintaining Internet Security* imposes civil liabilities on entities who infringed upon others' legitimate rights and interest through the Internet, and criminal liabilities on cyber fraud, hacking, creating and disseminating computer viruses, and illegally intercepting, tampering with, or deleting others' emails or other data. If the online activities do not constitute a crime but violate public security, they shall be punished by the relevant administrative regulations. See also Timothy L. Fort & Liu Junhai, *Chinese Business and the Internet: The Infrastructure for Trust*, 35 VAND. J. TRANSNAT'L L. 1545, 1566–69 (2002) (discussing China's legal framework for cyberspace, particularly with regard to access and registration).

⁶⁰ Weishan Miao, Min Jiang & Yunxia Pang, *Historicizing Internet Regulation in China: A Meta-Analysis of Chinese Internet Policies (1994–2017)*, 15 INT'L J. COMM'C'N 2003, 2015–19 (2021).

⁶¹ Rayburn & Conrad, *supra* note 1, at 471.

⁶² Ling & Naughton, *supra* note 5.

⁶³ Cao, Suttmeier & Simon, *supra* note 6.

⁶⁴ According to Schumpeter's theory, the driving force of economic development is not the change in consumer demands as claimed by equilibrium theory, but rather the way producers recombine existing factors of production in new ways, that is, innovation. This view on innovation has been fully discussed in China's official medias, such as the *Guangming Daily*, the CCP-sponsored newspaper. Xinshidai Xuyao Zheyang de Chuangxin (新时代需要这样的创新) [The New Era Calls for This Kind of Innovation], MOST (Mar. 5, 2018), https://www.most.gov.cn/ztzl/lhzt/lhzt2018/mtbdlhzt2018/201803/t20180305_138404.html [https://perma.cc/5DX2-K2GB] (China); Huang Yanghua (黄阳华), Xiongbite de "Chuangxin" Lilun (熊彼特的"创新"理论) [Schumpeter's Theory of "Innovation"], GUANGMING DAILY (Sep. 20, 2016), https://epaper.gmw.cn/gmrb/html/2016-09/20/nw.D110000gmrb_20160920_4-10.htm [https://perma.cc/8ZJP-XDUS] (China).

⁶⁵ RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE 27 (1982); Lun Gongcheng Keji Jinbu dui Jingji Fazhan de Zuoyong (论工程科技进步对经济发展的作用) [On the Role of Engineering and Technological

growing recognition emerged: Those who shape the course of emerging technologies are likely to command privileged positions in international production networks and enjoy outsized strategic benefits.⁶⁶

Together, these influences precipitated a gradual but significant shift in regulatory orientation. Technologies were no longer seen merely as engines of economic expansion but increasingly as instruments of national power—vehicles through which China might enhance state capacity, industrial modernization, and global competitiveness.⁶⁷ This transformation was particularly evident beginning in the early 2000s, as the state repositioned itself from a passive recipient of external innovation to an active architect of innovation.⁶⁸ A key milestone was the 2006 launch of the MLP, a comprehensive fifteen-year plan aimed at transforming China into a leading scientific power by 2050.⁶⁹ At the heart of the MLP was the principle of “independent innovation” (自主创新), which sought to elevate domestic technological capabilities and reduce dependence on foreign technologies from more than 50 percent to less than 30 percent by 2020.⁷⁰ The MLP marked the beginning of a concerted and institutionalized effort to integrate innovation into the core of national policy.

The implications of this shift were already apparent in the early 2000s. The government rolled out a series of national strategies to promote the digital economy, focusing on building digital infrastructures, developing the software industry, expanding information resources, and promoting e-commerce.⁷¹ Both central and local governments offered a mix of incentives, such as financial subsidies, tax rebates, and R&D grants, to stimulate enterprise-driven innovation and encourage commercial

Progress in Economic Development], CHINESE ACADEMY OF ENGINEERING (Jun. 15, 2009), https://www.cae.cn/cae/html/main/col84/2012-03/02/20120302135615928735679_1.html [https://perma.cc/3B27-XWKD] (China).

⁶⁶ Cao, Suttmeier & Simon, *supra* note 6.

⁶⁷ See Alvin Hoi-Chun Hung, *The Curious Case of Blockchain in Rural China: Unravelling Power, Profit, and Surveillance*, 11 BIG DATA & SOC’Y, Apr.–June 2024, at 3–4.

⁶⁸ See Ling & Naughton, *supra* note 5 (researching China’s government interventions into its technology development).

⁶⁹ Cao, Suttmeier & Simon, *supra* note 6, at 38.

⁷⁰ See Ling & Naughton, *supra* note 5, at 2141, 2146 (2016); Cao, Suttmeier & Simon, *supra* note 6, at 38; Dan Prud’homme, *Dynamics of China’s Provincial-Level Specialization in Strategic Emerging Industries*, 45 RSCH. POL’Y 1586, 1586 (2016).

⁷¹ *Endeavors to Spur the Development and Application of the Internet*, CHINA.ORG.CN (June 8, 2010), http://www.china.org.cn/government/whitepaper/2010-06/08/content_20208003.htm [https://perma.cc/KX4D-ENZJ].

applications of internet technologies.⁷² At the same time, in alignment with China's accession to the World Trade Organization, the state undertook notable liberalization measures. From 2001 to 2005, the State Council eased restrictions on foreign investment in non-sensitive internet sectors, including telecommunications and segments of the cultural and media industries.⁷³ This policy remained in place over the following decades. By 2025, there were over 2,400 foreign-invested telecommunications firms operating in China.⁷⁴

In retrospect, this strategy proved effective in accelerating China's digital and technological capacities. More importantly, it solidified a core regulatory conviction that innovation and control need not be mutually exclusive but can be jointly pursued within a carefully calibrated governance architecture. As Jack Goldsmith and Tim Wu commented, China is attempting to shape an internet that is open enough to sustain rapid economic growth, yet managed in ways that maintain social order and align with state priorities.⁷⁵ This delicate balancing act captures the essence of China's *developmental pragmatism*: while the overarching objectives of China's internet policy remain consistent in preserving state authority and promoting social stability, regulatory practices at the operational level enjoy a notable degree of flexibility.⁷⁶

B. STATE-LED REGULATORY AGILITY

The pragmatist philosophy has shaped the timing and posture of the state's engagement with emerging technologies. Over the past decade, the Chinese government has moved away from a predominantly reactive or wait-and-see stance to embrace a more anticipatory approach. For example, in 2016, President Xi described cybersecurity as a dynamic and

⁷² See *id.*; *Taxation and Technology Transfer: Key Issues*, UN (2005), at 27–28, https://unctad.org/system/files/official-document/iteipc20059_en.pdf [<https://perma.cc/SBH4-6APC>].

⁷³ Zhang & Ran, *supra* note 19, at 91.

⁷⁴ Gyongye he Xinxihuabu Shenru Tuijin Dianxinye Kuoda Kaifang Xiang Shoupi 13 Jia Waizi Qiye Fafang Jingyingshidian Pifu (工业和信息化部深入推进电信业扩大开放 向首批13家外资企业发放经营试点批复) [The Ministry of Industry and Information Technology Is Actively Advancing the Opening-Up of the Telecommunications Sector and Has Issued Pilot Operation Approvals to the First 13 Foreign-Funded Enterprises], Zhonghua Renmin Gongheguo Gongye he Xinxihuabu (中华人民共和国工业和信息化部) [MINISTRY INDUS. & INFO. TECH. CHINA] (Feb. 28, 2025, at 09:00 CT), https://wap.miit.gov.cn/xwfb/gxdt/sjdt/art/2025/art_12e905c29646482aab5a5d5038b08a45.html [<https://perma.cc/2XYG-9MAF>].

⁷⁵ GOLDSMITH & WU, *supra* note 55, at 89.

⁷⁶ Zhang & Ran, *supra* note 19, at 92.

open-ended endeavor, signaling a change toward a more agile regulatory framework.⁷⁷ Such an agile approach better equips the state to monitor technological developments in real time, fine-tune its regulatory instruments, mitigate emerging risks, and preserve institutional coherence. This approach also resonates with the social construction of technology theory, which holds that technological artifacts are particularly susceptible to contestation, interpretation, and reshaping during their formative stages.⁷⁸ Once stabilized, they tend to resist further transformation, thereby limiting the efficacy of regulatory or societal interventions.⁷⁹

1. *The Case of Cryptocurrency Regulation*

A case in point is the regulation of cryptocurrency in China. Back in 2013, when Bitcoin gained popularity around the world and most nations were still deliberating its future regulation, China's central bank, the People's Bank of China, quickly issued a notice barring financial institutions from handling Bitcoin transactions, rendering it one of the earliest major economies to regulate Bitcoin.⁸⁰ Concerns over Bitcoin include speculative trading, money laundering, tax evasion, investment scams, and cybersecurity.⁸¹ The notice also stressed that virtual currencies like Bitcoin do not possess the attributes of legal tender and must not be

⁷⁷ Fenji Zhong Liuhui Xinpian (奋楫中流绘新篇——习近平总书记指引网络安全工作述评) [Forging Ahead to Write a New Chapter: A Review of President Xi Jinping's Guidance on Cybersecurity], Add Chinese Roman Letters (中国网信) [CYBERSPACE ADMIN. CHINA] (Sep. 10, 2023, at 09:00 CT), https://www.cac.gov.cn/2023-09/10/c_1695939263461097.htm [<https://perma.cc/9QGJ-F7ST>].

⁷⁸ See Doherty, Coombs & Loan-Clarke, *supra* note 22, at 571; see Gaia Bernstein, *A Window of Opportunity to Regulate Addictive Technologies*, WIS. L. REV. FORWARD, 70–72 (Nov. 21, 2022), https://wlr.law.wisc.edu/wp-content/uploads/sites/1263/2022/11/Bernstein_Final.pdf [<https://perma.cc/G7QG-CFBC>].

⁷⁹ See Bernstein, *supra* note 78, at 70–71, 74.

⁸⁰ See *China Bans Banks from Handling Bitcoin Trade*, BBC (Dec. 5, 2013), <https://www.bbc.com/news/technology-25233224#:~:text=> [<https://perma.cc/E2QK-GLQD>]. For the official document, Renmin Yinhang deng Wubuwei Fabu Guanyu Fangfan Bitebi Fengxian de Tongzhi (人民银行等五部委发布关于防范比特币风险的通知) [The People's Bank of China and Four Other Ministries Issued a Notice on Preventing Bitcoin Risks], Add Chinese Roman Letters (Add Chinese Characters) [CENT. PEOPLE'S GOV'T CHINA] (Dec. 5, 2013, at 16:12 CT), https://www.gov.cn/gzdt/2013-12/05/content_2542751.htm [<https://perma.cc/UJ8F-2LTV>].

⁸¹ S. Ari Mushell, *Bitcoin Mania: Will It Matter?*, 132 BANKING L.J. 322, 328–331, 335 (2015); Matthew Kien-Meng Ly, *Coining Bitcoin's "Legal-Bits": Examining the Regulatory Framework for Bitcoin and Virtual Currencies*, 27 HARV. J.L. & TECH. 587, 594–95 (2014); Chen Jia, *Authorities Get Clarity on Digital Money*, CHINA DAILY (Aug. 6, 2021), <https://www.chinadaily.com.cn/a/202108/06/WS610ca307a310efa1bd667262.html> [<https://perma.cc/G3VM-S9GS>] (discussing the financial risks of cryptocurrency).

traded as commodities in the market.⁸² Since then, multiple administrative agencies in China have issued a series of regulations, reiterating their stance on the prohibition of crypto services.⁸³ As a result, Initial Coin Offerings were outlawed and cryptocurrency exchange was prohibited in China.⁸⁴ In 2021, a joint statement was released from multiple government authorities, declaring that all crypto transactions, trading, and investments are illegal, marking the demise of cryptocurrency in mainland China.⁸⁵

It would be unjust, however, to suggest that Chinese regulators harbor solely hostility towards cryptocurrency. Concerned that China might lose its edge in these uncharted waters, Hong Kong initiated a new crypto licensing regime in June 2023, which enables retail investors to engage in crypto trading on regulated exchanges.⁸⁶ By 2025, the city's securities regulator had approved seven cryptocurrency exchanges, quietly positioning Hong Kong as a vital gateway to digital assets.⁸⁷ Pragmatism here is manifested as a measured embrace of innovation, tempered by a watchful awareness of its inherent risks.

⁸² *China Bans Banks from Handling Bitcoin Trade*, *supra* note 80.

⁸³ Muyao Shen, *China Reiterates Crypto Bans from 2013 and 2017*, COINDESK (Sep. 14, 2021, at 07:57 CT), https://www.coindesk.com/markets/2021/05/18/china-reiterates-crypto-bans-from-2013-and-2017?_https://perma.cc/L6F2-P4GE.

⁸⁴ Remin Yinhang deng Qibumen Guanyu Fangfan Daibi Faxing Rongzi Fengxian de Gonggao (人民银行等七部门关于防范代币发行融资风险的公告) [The People's Bank of China and Six Other Ministries Issued a Notice on Preventing Risks Associated with Token Issuance and Financing] [CENT. PEOPLE'S GOV'T CHINA] (Sep. 4, 2017, at 21:31 CT), https://web.archive.org/web/20180617042331/https://www.gov.cn/xinwen/2017-09/04/content_5222657.htm [https://perma.cc/6XYR-PK2Q].

⁸⁵ See Andrey Sergeenkov, *China Crypto Bans: A Complete History*, COINDESK (May 11, 2023, at 10:49 CT), <https://www.coindesk.com/learn/china-crypto-bans-a-complete-history> [https://perma.cc/7Q8A-NSUA].

⁸⁶ See generally *Guidelines for Virtual Asset Trading Platform Operators*, SEC. & FUTURES COMM'N (June 2023), <https://www.sfc.hk/-/media/EN/assets/components/codes/files-current/web/guidelines/Guidelines-for-Virtual-Asset-Trading-Platform-Operators/Guidelines-for-Virtual-Asset-Trading-Platform-Operators.pdf> [https://perma.cc/KE9J-ZGHJ] (discussing how China regulates exchanges amongst investor in the realm of cryptocurrency).

⁸⁷ Xinmei Shen, *Hong Kong Licenses 4 More Crypto Exchanges Amid Bitcoin Price Surge*, S. CHINA MORNING POST (Dec. 18, 2024, at 20:56 CT), <https://www.scmp.com/tech/blockchain/article/3291418/hong-kong-licences-four-more-crypto-exchanges-amid-bitcoin-price-surge> [https://perma.cc/SS7F-TSU2].

2. The Case of E-CNY Experiment

Moreover, China is one of the first major economies to introduce a sovereign digital currency.⁸⁸ Since 2014, the central bank has advanced research and development in this area, culminating in the launch of the E-CNY in 2020.⁸⁹ E-CNY is a digital counterpart to the renminbi, endowed with all the basic functions of legal tender and issued under the authority of the People's Bank of China.⁹⁰ Unlike decentralized cryptocurrencies such as Bitcoin, the E-CNY is centrally issued and governed,⁹¹ reflecting the state's intent to maintain control over monetary innovation. Pilot programs soon followed in cities like Shenzhen and Suzhou, spanning sectors from retail and dining to logistics and public transportation.⁹² This initiative reveals the technocratic ambitions of Chinese regulators—an embodiment of high-modernist confidence in the rational design of social and technological systems.⁹³ At its core, the program is animated by sweeping objectives: to disrupt the dominance of private payment platforms, to curb illicit financial activities, and to establish China as a standard-setter in the global digital currency regime.⁹⁴

However, the banal reality undermines the state's expectations. Compared to the prevalence and convenience of Alipay and WeChat Pay, E-CNY holds modest appeal for Chinese users. As of 2023, the adoption of E-CNY has been limited; in some instances, the government even had

⁸⁸ John Ninia, *China's E-Currency is the World's First Sovereign Digital Currency*, CORN. SC JOHNSON COLL. OF BUS. (Jan. 13, 2021), <https://business.cornell.edu/hub/2021/01/13/chinas-e-currency-worlds-first-sovereign-digital-currency/> [https://perma.cc/64YG-RTBC].

⁸⁹ Since 2014, the PBOC has been working on a Digital Currency/Electronic payments project. Yuan Yang & Hudson Lockett, *What is China's Digital Currency Plan?*, FIN. TIMES (Nov. 25, 2019, at 06:44 CT), <https://www.ft.com/content/e3f9c3c2-0aaf-11ea-bb52-34c8d9dc6d84> [https://perma.cc/V9CS-TNTV]; Jonathan Cheng, *China Rolls Out Pilot Test of Digital Currency*, WALL ST. J. (Apr. 20, 2020, at 08:22 ET), <https://www.wsj.com/articles/china-rolls-out-pilot-test-of-digital-currency-11587385339> [https://perma.cc/Y2NL-8VST].

⁹⁰ Jiaying Jiang & Karman Lucero, *Background and Implications of China's E-CNY*, 33 U. FLA. J.L. & PUB. POL'Y 237, 241 (2023).

⁹¹ *Id.*

⁹² See Cheng, *supra* note 89.

⁹³ See JAMES C. SCOTT, *SEEING LIKE A STATE 4* (1998) (“[High modernism] is best conceived as a strong...version of the self-confidence about scientific and technical progress ... and, above all, the rational design of social order commensurate with the scientific understanding of natural laws.”).

⁹⁴ The mobile payment market in China is dominated by two private companies, Alibaba with Alipay and Tencent with WeChat Pay. Alibaba held 55.1% of the market share, while Tencent accounted for 38.9%, effectively creating a duopoly that dominated the mobile payments sector worth trillions of dollars. See Jiang & Lucero, *supra* note 90, at 250, 257; Cheng, *supra* note 89.

to pay people to use it.⁹⁵ Chinese scholars have pointed to several obstacles: limited usage scenarios, inadequate public outreach, cumbersome implementation, and the public's broader hesitation toward new technologies.⁹⁶ Added to these are concerns over surveillance, including the fear that E-CNY may furnish the state with expanded tools for monitoring financial behavior.⁹⁷ While Mu Changchun, Director-General of the People's Bank of China's Digital Currency Institute, has pledged to protect user anonymity, it remains unclear how the state will reconcile the competing demands of privacy and enforcement.⁹⁸

The regulatory history of virtual currencies in China presents a more intricate portrait of agility than conventional accounts of policy responsiveness or bureaucratic efficiency allow. From an STS perspective, law "function[s] as a medium for constructing and stabilizing particular orderings of science and technologies in society."⁹⁹ In this context, China's agile regulation operates as a mode of sociotechnical ordering, enabling the state to both discipline undesirable innovations and mobilize desirable ones. In the first instance, this agility is driven by a fear of losing informational sovereignty. Regulatory action becomes a tool of containment, deployed to extinguish technologies like decentralized cryptocurrencies that challenge the state's infrastructural authority. In the second, agility is enlisted in the service of techno-solutionism: a vehicle for promoting state-led innovation with the ambition of setting global standards in emergent fields.

Yet this dual use of agility exposes internal tensions. While agile regulation is often praised for its flexibility, adaptability, and ability to

⁹⁵ Jiang & Lucero, *supra* note 90, at 256.

⁹⁶ Huang Guoping (黄国平), Ding Yi (丁一) & Li Wanrong (李婉溶), Shuzi Renminbi de Fazhan Qushi, Yingxiang Chongji ji Zhengcejianyi (数字人民币的发展态势、影响冲击及政策建议) [Development Trends, Impact and Policy Recommendations for E-CNY], 451 Add Chinese Romanization (财经问题研究) [RSCH. FIN. & ECON. ISSUES] 60, 67 (2021); Roger Huang, *A 2025 Overview Of The E-CNY, China's Digital Yuan*, FORBES (Jul. 15, 2024), <https://www.forbes.com/sites/digital-assets/2024/07/15/a-2024-overview-of-the-e-cny-chinas-digital-yuan/> [<https://perma.cc/C95P-KE42>]; Wang Jiajia (王佳佳) & Shen Kunrong (沈坤荣), Chinese Romanization (推进数字人民币发展的现实挑战与优化路径) [Practical Challenges and Optimization Paths of Promoting the Development of E-CNY], 469 Chinese Romanization (Chinese Characters) [ECO. REV. J.] 121, 124–25 (2021).

⁹⁷ James T. Areddy, *China Creates Its Own Digital Currency, a First for Major Economy*, WALL ST. J. (Apr. 5, 2021, at 10:48 ET), <https://www.wsj.com/articles/china-creates-its-own-digital-currency-a-first-for-major-economy-11617634118> [<https://perma.cc/Q342-7EFS>].

⁹⁸ Yang & Lockett, *supra* note 89.

⁹⁹ SHEILA JASANOFF, *SCIENCE AT THE BAR: LAW, SCIENCE, AND TECHNOLOGY IN AMERICA* xv (1995).

foster innovation,¹⁰⁰ in practice, it may become overdetermined by political imperatives, especially when used to direct top-down technological development. The case of digital currency regulation illustrates this clearly. Although the state succeeded in eliminating private cryptocurrencies with remarkable speed, it has faced persistent challenges in generating widespread adoption of its own centralized alternative, *i.e.*, the E-CNY. The contrast is telling: agility in prohibition does not translate into agility in promotion, particularly when the latter lacks meaningful stakeholder participation or public engagement. Regulatory efforts that fail to engage the public, account for their lived experiences, or reflect their values risk producing technologies that are technically viable but socially unmoored.¹⁰¹ As explored in Part III, the absence of participatory mechanisms and bottom-up engagement diminishes the capacity of agile regulation to produce outcomes that are sustainable, trusted, or widely embraced.

C. POLICY AS A GOVERNING TOOL

Another defining feature of China's governance of emerging technologies is its reliance on policy instruments as a primary mode of regulation. The reliance on policy instruments could be attributed to three main reasons: the urgency to address novel technological developments, the structural inertia of the legislative process, and the technocratic expertise of the administrative agencies. Over time, policy documents have ceased to function merely as provisional measures filling legislative gaps. Instead, they have assumed a more autonomous role: setting strategic priorities, delineating regulatory boundaries, and shaping market behavior.¹⁰² This section examines the rise of this policy-centric model

¹⁰⁰ See, e.g., *Agile Governance: Reimagining Policy-Making in the Fourth Industrial Revolution*, WORLD ECON. F., Jan. 2018, at 4, 6, https://www3.weforum.org/docs/WEF_Agile_Governance_Reimagining_Policy-making_4IR_report.pdf [<https://perma.cc/PM6S-A9SU>]; Dylan Desjardins, *Unpacking the OECD Recommendation on Agile Regulatory Governance*, GW REGUL. STUD. CTR. (Oct. 28, 2021), <https://regulatorystudies.columbian.gwu.edu/unpacking-oecd-recommendation-agile-regulatory-governance> [<https://perma.cc/3BCE-NW5Y>].

¹⁰¹ JAMES WILSDON & REBECCA WILLIS, *SEE-THROUGH SCIENCE: WHY PUBLIC ENGAGEMENT NEEDS TO MOVE UPSTREAM* 38–39 (2004).

¹⁰² In China, there are various types of policy documents, and they are ranked based on factors such as access rights, implementation flexibility, and their stage of development in the policymaking process. Andrew Mertha defines different types of policy documents as follows:

At one extreme, orders (命令) are to be carried out without question; decisions (决定) allow an ever-so-slight degree of flexibility in their implementation; regulations (规定)

and considers its broader implications for the regulation of technology in China.

1. Regulation Without Legislation

Compared to legislative regulation, regulation through policies affords state regulators greater agility in responding to emerging technologies. The legislative process in China is notoriously complex and protracted.¹⁰³ Statistics show that nearly half of proposed laws fail to pass within the planned legislative timeframe and about 12 percent take over a decade to be enacted.¹⁰⁴ In the field of internet regulation, even milestone statutes such as the 2016 Cybersecurity Law often lag behind the pace of technological innovation.¹⁰⁵ Unlike the lengthy legislative process, policy formulation proceeds with remarkable speed in China.¹⁰⁶ The state's policy behavior follows a distinct model, termed by Chinese scholars as "truncated decision-making and deliberative implementation."¹⁰⁷ Under this model, the decision-making process is expedited, often bypassing standard deliberative procedures, while the implementation phase remains

) posit those cases to be followed to the letter while specifying others in which only the spirit of the policy is to be considered; instructions (指示) provide an opportunity for experimentation, subsequently reviewed by higher-ups; circulars (通知) are used as cover letters for reference materials to explain how they are to be used; while opinions (意见) suggest that the policy is still being discussed at the policy making stage and considered tentative.

Andrew Mertha, *Bureaucracy and Policy Making*, in 1 THE SAGE HANDBOOK OF CONTEMPORARY CHINA, 365, 376–77 (Weiping Wu & Mark W. Frazier eds., 2018).

¹⁰³ The process of lawmaking in China typically involves five key stages: agenda-setting, inter-agency review, top leadership approval, NPC debate and passage, and subsequent implementation. Each stage is shaped by distinct political actors, and the political dynamics at each stage influence the content of the laws in varying ways. Murray Scot Tanner, *How a Bill Becomes a Law in China: Stages and Process in Lawmaking*, CHINA Q., Mar. 1995, at 39, 41, 44–45. See also Rory Truex, *Authoritarian Gridlock? Understanding Delay in the Chinese Legislative System*, 53 COMPAR. POL. STUD. 1455, 1456 (2020) (arguing that Chinese lawmakers contend with a diverse array of competing interests within the ruling coalition and an urgent need to respond to a particular citizen grievance).

¹⁰⁴ Truex, *supra* note 103, at 1455.

¹⁰⁵ In 2016, China passed its Cybersecurity Law, the texts of which are rather vague, leaving great interpretive flexibility to regulators. Jyh-An Lee, *Hacking Into China's Cybersecurity Law*, 53 WAKE FOREST L. REV. 57, 60–64 (2018).

¹⁰⁶ Lan Xue & Jing Zhao, *Truncated Decision Making and Deliberative Implementation: A Time-Based Policy Process Model for Transitional China*, 48 POL'Y STUD. J. 298, 299 (2020) (noting that the Chinese government carried out public policies in a timely fashion to respond to social outcries).

¹⁰⁷ *Id.*

flexible, open to revision and contextual adjustment.¹⁰⁸ Government policies are issued at an accelerated pace, often within months after recognizing a need for regulation. The rapid policymaking is further facilitated by China's centralized, top-down governance structure, which enables swift responses to emerging risks and technological developments. Since the 2010s, there has been a proliferation of internet governance policies originating from different government branches, predominantly the Cyberspace Administration of China (CAC).¹⁰⁹

Another key factor that accounts for this policy-driven approach is the innate institutional design of China's lawmaking process. In China, the authority over lawmaking, theoretically unified, is distributed among the National People's Congress, the State Council, and local governments.¹¹⁰ Due to limited legislative capacity within the National People's Congress and its Standing Committee, the drafting of laws has historically relied, and will continue to rely, on administrative agencies. Most legislative proposals originate within ministries,¹¹¹ consolidating substantial lawmaking authority within the administrative apparatus. As Angela Huyue Zhang aptly observes, the "policy signal becomes a source of law."¹¹² Even when official documents are labeled as mere "opinions," indicating a tentative or consultative status, they often exert binding regulatory force.¹¹³

Moreover, administrative agencies' technocratic backgrounds enable them to craft policies that are better suited to the distinctive characteristics of emerging technologies. A significant proportion of ministries under the State Council are headed by officials with engineering degrees or prior technical experience.¹¹⁴ Empirical research also suggests that recent civil service recruitment has increasingly favored highly educated and technically trained candidates. A study by the Asia Society's Centre for China Analysis finds that nearly half of the youngest bureau-level officials hold doctoral degrees, with a substantial share possessing

¹⁰⁸ *Id.*

¹⁰⁹ Cai & Dai, *supra* note 19, at 97.

¹¹⁰ Truex, *supra* note 103, at 1457.

¹¹¹ *The PRC Legislative Process: Rule Making in China*, U.S.-CHINA BUS. COUNCIL 2 (2009), https://www.uschina.org/wp-content/uploads/2013/06/prc_legislative_process.pdf [<https://perma.cc/66AJ-D9LB>].

¹¹² Zhang, *supra* note 17, at 15.

¹¹³ Mertha, *supra* note 102, at 377.

¹¹⁴ Liu Yongmou, *The Benefits of Technocracy in China*, ISSUES IN SCI. & TECH. (2016), <https://issues.org/perspective-the-benefits-of-technocracy-in-china> [<https://perma.cc/7GCN-5NWQ>].

technical backgrounds.¹¹⁵ Key technology gatekeepers, such as the CAC and MIIT, thus possess the knowledge and capacity needed to oversee and regulate emerging technologies.

In sum, the policy-driven approach allows the state to stabilize the meaning of emerging technologies before legal categories are fully formed. Through policy, the state signals which innovations are encouraged, tolerated, or discouraged, thus shaping public expectations and market behavior in advance. In practice, a negative policy stance toward a given technology may operate as a *de facto* ban, irrespective of the absence of formal legal prohibitions. This strategic use of policy instruments exemplifies the pragmatic agility of the Chinese regulatory state: instead of awaiting legislative consensus, it acts preemptively to mitigate risk, influence technological trajectories, and maintain control over the sociotechnical order.

2. The Case of NFT Regulation

Policy documents thus function as essential guideposts, standards, and alter ego black-letter code on emerging technologies. The regulation of non-fungible tokens (NFTs) illustrates this dynamic. Following the surge of NFT popularity during the COVID-19 pandemic, Chinese regulators quickly flagged speculative trading and financial risk as pressing concerns. In response, three central agencies issued the *Initiative to Prevent Relevant Financial Risks of NFTs* in 2022. The initiative advocated for the use of fiat currency over cryptocurrency in NFT transactions and required real-name authentication for all creation and trading activities to ensure compliance with anti-money laundering laws.¹¹⁶ It further restricted the types of assets NFTs could represent, explicitly prohibiting any linkage to financial products such as securities or insurance.¹¹⁷ Despite its formally non-binding nature, the initiative was widely treated as binding by NFT platforms across China. In anticipation

¹¹⁵ Jeffrey Wu, *China's Technocratic Elite Will Be a Powerful Force in Rivalry with US*, S. CHINA MORNING POST (May 4, 2025), <https://www.scmp.com/opinion/china-opinion/article/3308646/chinas-technocratic-elite-will-be-powerful-force-rivalry-us> [https://perma.cc/NR7J-8QL5].

¹¹⁶ Guanyu Fangfan NFT Xiangguan Jinrong Fengxian De Changyi(关于防范 NFT 相关金融风险的倡议)[The Initiative to Prevent Relevant Financial Risks of Non-Fungible Token] (promulgated by the China Nat'l Internet Fin. Ass'n, Apr. 13, 2022) [hereinafter the Initiative]. The Initiative is not a mandatory rule but represents the government's regulatory attitude as it is published by official industry organizations.

¹¹⁷ *Id.*

of regulatory scrutiny, most platforms voluntarily curtailed or eliminated secondary market transactions—some even restricting peer-to-peer transfers such as gifting.¹¹⁸ This episode reveals how policy instruments can exert powerful regulatory effects despite lacking legal codification. Regulation here is not merely reactive or procedural; it is performative and constitutive, shaping both the material practices and symbolic meanings of technology through anticipatory, flexible interventions.

Such a flexibility can invite epistemic risks. The truncated nature of China's decision-making process often sidesteps transparent deliberation underpinning regulatory choices. As a result, regulatory decisions may rely on "black-boxed" forms of expertise, deploying science not as an open-ended process of inquiry but as a tool for legitimizing predetermined decisions.¹¹⁹ Put simply, regulators may misuse science.¹²⁰ When scientific claims are deployed rapidly and without sufficient reflexivity, they may weaken the credibility and durability of regulatory knowledge.¹²¹ These tensions become especially acute in the context of AI regulation—a challenge addressed in Part III.

II. REGULATING ARTIFICIAL INTELLIGENCE: CONTINUITY WITH RECONFIGURATION

Against the backdrop of China's established regulatory framework on emerging technologies, the state's sweeping measures on AI unfold with a sense of inevitability. These measures are neither abrupt nor incoherent; rather, they resonate with the underlying logic of *developmental pragmatism*, which privileges flexibility in regulatory means while holding firm to social stability, state control, and economic modernization.¹²² This Part is organized around the core features of China's AI regulation by first examining how calibrated control operates in practice through gap-filling, risk-sensitive regulation that targets specific AI use cases. It then analyzes China's distinctive model of governance by design, focusing on how political values and social

¹¹⁸ It is noteworthy that secondary trading of NFTs is allowed if conducted under the state-backed secondary trading platform which was established in Beijing in 2023. See Ran Xi, *Application-Oriented: A Polycentric Framework for Non-Fungible Tokens*, 50 RUTGERS COMPUT. & TECH. L.J. 205, 248–49 (2024).

¹¹⁹ Xue & Zhao, *supra* note 106, at 301–02, 319 (noting that sometimes rapid policy response is based on political instinct rather than calculated rational analysis).

¹²⁰ See JASANOFF, *supra* note 99, at 73.

¹²¹ Xue & Zhao, *supra* note 106, at 320.

¹²² Zhang & Ran, *supra* note 19.

priorities are embedded *ex ante* into AI systems through regulatory tools such as registration and security assessment. It then turns to the coproduction of innovation and regulation, delving into how private firms have been drawn into the governance process as standard-setters, compliance actors, and institutional collaborators, particularly in the context of connected and autonomous vehicles (CAVs). Taken together, these sections illuminate how China's AI governance is structured not simply as a sequence of regulatory responses, but as an evolving assemblage of control, innovation, and collaboration that collectively shapes the trajectory of AI development.

A. CALIBRATED CONTROL: APPLICATION-ORIENTED AI REGULATION

Although AI was conceptualized over seventy years ago, it is considered an emerging technology due to major recent advances.¹²³ Current AI applications span various domains, from medical diagnostics and AVs to theorem proving, professional consultancy, and creative content generation.¹²⁴ These developments have sparked unprecedented investment: global AI spending is projected to surpass \$630 billion by 2028, driven by annual growth of nearly thirty percent.¹²⁵ In both ambition and scope, AI is becoming “universal.”¹²⁶

Within this context, China has pursued a regulatory strategy that aligns with its broader philosophy of *developmental pragmatism*: an application-oriented approach that privileges timely, tailored policy intervention over rigid legislative formalities. While China initially signaled interest in adopting a comprehensive AI law akin to the EU's AI Act,¹²⁷ it ultimately embraced a more flexible regulatory framework which

¹²³ Inga Ulmiche, William Knight, Tonii Leach, Bernd Carsten Stahl & Winter-Gladys Wanjiku, *Framing Governance for a Contested Emerging Technology: Insights from AI Policy*, 40 POL'Y & SOC'Y 158, 161–62 (2021).

¹²⁴ *Id.* at 158; LAURIE A. HARRIS, CONG. RSCH. SERV., IF10608, OVERVIEW OF ARTIFICIAL INTELLIGENCE (2017).

¹²⁵ Karen Massey, *A Deep Dive into IDC's Global AI and Generative AI Spending*, IDC BLOG (Aug. 16, 2024), <https://blogs.idc.com/2024/08/16/a-deep-dive-into-idcs-global-ai-and-generative-ai-spending/> [<https://perma.cc/2S8Y-X738>].

¹²⁶ See generally Bhaskar Chakravorti, *AI's Trust Problem*, HARV. BUS. REV. (May 3, 2024), <https://hbr.org/2024/05/ais-trust-problem> [<https://perma.cc/F2CD-K7ES>] (stating that “the tech industry is racing to add to the pileup of generative AI models.”).

¹²⁷ China's attitude on enacting a comprehensive AI law appears to be shifting. While the State Council's 2023 and 2024 *Legislative Work Plans* explicitly stated the intention to submit a draft Artificial Intelligence Law to the Standing Committee of the National People's Congress, the 2025 *Work Plan* adopts more cautious language, merely stating that it will “promote legislation for the healthy development of artificial intelligence,” without referencing a specific law by name. This

has yielded a suite of targeted rules and policies focused on specific AI-driven use cases. The existing AI-related policies include, but are not limited to, those on algorithm recommendations,¹²⁸ deep synthesis,¹²⁹ AVs,¹³⁰ and generative AI.¹³¹ The functional orientation differs from a purely sectoral approach because it focuses not on rigid industry classifications but on the concrete deployment and social effects of AI technologies. Some scholars have characterized this method as specialized gap-filling, an adaptive, risk-sensitive approach that allows regulators to

change suggests a potential recalibration in China's legislative strategy for AI. For more discussions on a comprehensive AI law, see Ran Xi, *On Emerging Technologies: The Old Regime and the Proactivity*, 8 CARDOZO INT'L & COMPAR. L. REV 75, 132 (2025); see also Mimi Zou & Lu Zhang, *Navigating China's Regulatory Approach to Generative Artificial Intelligence and Large Language Models*, in 1 CAMBRIDGE FORUM ON AI: LAW & GOVERNANCE, 14 (2025); but see Guowuyuan 2025 niandu Lifa Gongzuo Jihua (国务院2025年度立法工作计划) [Issuing Notice on the State Council's Legislative Work Plan for 2025] (promulgated by the Gen. Off. of St. Council, May 4, 2025, effective May 14, 2025), https://www.gov.cn/zhengce/content/202505/content_7023697.htm [<https://perma.cc/XV4N-P2G4>] (noting that, because China's new 2025 Work Plan adopts more cautious language, China's attitude on enacting a comprehensive AI law appears to be shifting). For more discussions on a comprehensive AI law, see Ran Xi, *On Emerging Technologies: The Old Regime and the Proactivity*, 8 CARDOZO INT'L & COMPAR. L. REV 75, 132 (2025); Mimi Zou & Lu Zhang, *Navigating China's Regulatory Approach to Generative Artificial Intelligence and Large Language Models*, in 1 CAMBRIDGE FORUM ON AI: LAW & GOVERNANCE, 14 (2025).

¹²⁸ Guanyu Jiaqiang Hulianwang Xinxi Fuwu Suanfa Zonghe Zhili De Zhidao Yijian (关于加强互联网信息服务算法综合治理的指导意见) [Guiding Opinions on Strengthening Overall Governance of Internet Information Service Algorithms] (promulgated by the St. Internet Off., Sep. 17, 2021, effective Sep. 29, 2021), http://www.cac.gov.cn/2021-09/29/c_1634507915623047.htm [<https://perma.cc/GW9A-FGT7>].

¹²⁹ Hulianwang Xinxi Fuwu Shendu Hecheng Guanli Guiding (互联网信息服务深度合成管理规定) [Provisions on the Administration of Deep Synthesis Internet Information Services] (promulgated by the St. Internet Info. Off., Nov. 25, 2022, effective Jan. 10, 2023) [hereinafter Deep Synthesis Regulation], https://www.gov.cn/zhengce/zhengceku/2022-12/12/content_5731431.htm [<https://perma.cc/SC3J-8939>]. For English translation, *Provisions on the Administration of Deep Synthesis Internet Information Services*, CHINA L. TRANSLATE (Dec. 11, 2022), <https://www.chinalawtranslate.com/en/deep-synthesis/> [<https://perma.cc/267X-PJMB>].

¹³⁰ Gongye he Xinxihuabu Gonganbu Zhufang he Chengxiangjianshe bu Jiaotongyunshubu Guanyu Kaizhan Wanglianqiche Zhunru he Shanglu Tongxing Shidian Gongzuo de Tongzhi (工业和信息化部 公安部 住房和城乡建设部 交通运输部关于开展智能网联汽车准入和上路通行试点工作的通知) [Notice from Four Ministries on Conducting Pilot Programs for Access and Road Access of Intelligent Connected Vehicles] (promulgated by the Ministry of Indus. and Tech., Nov. 17, 2023), https://www.gov.cn/zhengce/zhengceku/202311/content_6915788.htm [<https://perma.cc/KRA3-SVPM>].

¹³¹ Shengchengshi Rengong Zhineng Guanli Zanxing Banfa (生成式人工智能管理暂行办法) [Interim Administrative Measures for Generative Artificial Intelligence Services] (promulgated by the St. Internet Info. Off., July 10, 2023) [hereinafter CAC], http://www.cac.gov.cn/2023-04/11/c_1682854275475410.htm [<https://perma.cc/J6WL-RD8L>]. For English translation, *Interim Measures for the Management of Generative Artificial Intelligence Services*, CHINA L. TRANSLATE (July 13, 2023), <https://www.chinalawtranslate.com/en/generative-ai-interim/> [<https://perma.cc/JFF5-3ZK5>].

address challenges as they emerge within discrete, rapidly evolving domains.¹³² The logic is pragmatic: many AI applications cut across sectors and defy traditional boundaries, requiring governance mechanisms that are equally agile and multidimensional.¹³³ For instance, algorithmic recommendation systems now shape user experience across healthcare, financial services, e-commerce, and law. In response, the CAC issued the 2022 *Provisions on the Management of Algorithmic Recommendation Services*, requiring algorithm registration and imposing obligations related to transparency, fairness, and content governance.¹³⁴

Unsurprisingly, this agility has produced a regulatory landscape both dense and dynamic. In July 2017, China unveiled the Next Generation Artificial Intelligence Development Plan, marking the nation's strategic commitment to AI and catalyzing a wave of policy activities.¹³⁵ Since then, hundreds of AI-related laws, regulations, and policy documents have been issued at both central and municipal levels.¹³⁶ In just the first half of 2024, more than 180 AI-related policies were introduced, underscoring a deeply policy-oriented and iterative approach to AI governance.¹³⁷ While this flurry of regulatory activities may seem fragmented at first glance, it reflects a coherent underlying logic: the use of context-sensitive, policy-led experimentation anchored in *developmental pragmatism*. Moreover,

¹³² Xiongbiao Ye, Yuhong Yan, Jia Li & Bo Jiang, *Privacy and Personal Data Risk Governance for Generative Artificial Intelligence: A Chinese Perspective*, 48 TELECOMM. POL'Y, 2024, at 6.

¹³³ See Gary E. Marchant & Carlos Ignacio Gutierrez, *Soft Law 2.0: An Agile and Effective Governance Approach for Artificial Intelligence*, 24 MINN. J.L. SCI. & TECH. 375, 385 (2023).

¹³⁴ Hulianwang Xinxifuwu Suanfa Tuijian Guanli Guiding (互联网信息服务算法推荐管理规定) [Provisions on the Management of Algorithmic Recommendations in Internet Information Services] (promulgated by the St. Internet Info. Off., Dec. 31, 2021, effective Mar. 1, 2022), https://www.cac.gov.cn/2022-01/04/c_1642894606364259.htm [https://perma.cc/8HGN-NABV]. For English translation version, *Provisions on the Management of Algorithmic Recommendations in Internet Information Services*, CHINA L. TRANSLATE (Jan. 4, 2022), <https://www.chinalawtranslate.com/en/algorithms/> [https://perma.cc/TKH3-HRXV].

¹³⁵ Some have speculated that the Plan was fueled by the historical Go match between world No.1-ranked player Ke Jie and AlphaGo, the AI system developed by Google's DeepMind, in which Ke Jie lost 3-0 to the machine. Winston Ma, *China's Approach to Data and AI Is Changing. Here's What That Means*, WORLD ECON. F. (Jan. 11, 2024), <https://www.weforum.org/stories/2024/01/chinas-data-and-ai-approach-is-changing-heres-what-that-means/> [https://perma.cc/Y4J3-27CP].

¹³⁶ The exact number of AI laws and regulations in China varies depending on the definitional scope of AI. Besides, many Chinese policies on digital economy also touch AI-related areas such as algorithm, facial recognition, and robotics.

¹³⁷ 锋行链盟 [Fengxing Blockchain Alliance], 2024 年上半年人工智能政策汇总完整版180项 [附下载] [Complete Compilation of 180 AI Policies in the First Half of 2024 | Download Included], 东方财富网 [East Money] (Sep. 22, 2024), <https://caifuha0.eastmoney.com/news/20240922141312622817800> [https://perma.cc/3LYF-4QEW].

consistent with the social construction of technology theory, the policy-driven approach views AI not as a neutral instrument, but as a system embedded with political, social, and economic values. Chinese regulators understand that technologies are neither autonomous nor deterministic; they are mediated by institutional logics and political priorities. As the next section explores, the regulatory choices are deeply value-laden, shaping what kinds of AI futures are imagined, enacted, and excluded.

B. DESIGN-BASED GOVERNANCE: EMBEDDING VALUES INTO AI SYSTEMS

As suggested by Orly Lobel, “ethical choices should ... be embedded in the initial design of AI systems, rather than only being introduced as down-the-line fixes or afterthoughts.”¹³⁸ In China, the ethical choices, along with particular understandings of social life and order, are proactively designed and inscribed into the fabric of AI regulation.¹³⁹

Take China’s Generative AI Measures as an illustration. In April 2023, in order to manage the emerging generative AI products represented by ChatGPT, the CAC published the Draft Measures for Generative Artificial Intelligence Services.¹⁴⁰ Three months later, the CAC updated the draft version after gathering advice from the public and issued the Interim Administrative Measures for Generative Artificial Intelligence Services (“Generative AI Measures”).¹⁴¹ The Generative AI Measures specifically target technologies capable of autonomously generating text, images, audio, video, and other content forms.¹⁴² One of the key components of the Generative AI Measures is to impose a registration requirement on AI service providers. Registration is a common instrument that regulators employ to increase transparency, protect consumers, and

¹³⁸ Orly Lobel, *The Law of AI for Good*, 75 FLA. L. REV. 1073, 1085 (2023).

¹³⁹ Sara Migliorini, *China’s Interim Measures on Generative AI: Origin, Content and Significance*, 53 COMPUT. L. & SEC. REV., May 2024, at 5; see also Jasanoff & Kim, *supra* note 28 (“[s]uch visions, and the policies built upon them, have the power to influence technological design”).

¹⁴⁰ Shengchengshi Rengong Zhineng Fuwu Guanli Zanxing Banfa (生成式人工智能服务管理暂行办法(征求意见稿)) [Interim Administrative Measures for Generative Artificial Intelligence Services ((Draft for Soliciting Opinions)], Add Romanization (中国网信)[CAC] (Apr. 11, 2023, at 12:53 CT), http://www.cac.gov.cn/2023-04/11/c_1682854275475410.htm [https://perma.cc/ARQ6-AVBC].

¹⁴¹ CAC, *supra* note 131.

¹⁴² *Id.*

enhance social and national security.¹⁴³ In this context, it serves not only an administrative function, but also reflects broader sociopolitical concerns. An important underlying reason for the registration requirement is out of concerns that technologies like ChatGPT may produce illegal or inflammatory information that disrupts social stability or threatens national security.¹⁴⁴ Therefore, at the very beginning of the Generative AI Measures, Article 4 mandates that the provision and use of generative AI services must respect social morality and ethics, uphold socialist core values, and prohibit the generation of content that incites the subversion of state power or endangers national security and interests.¹⁴⁵ Article 4 further establishes several obligations for AI service providers, underscoring the state's expectations for responsible conduct. These obligations include protecting intellectual property rights, safeguarding individuals' legal rights, and improving the accuracy and reliability of generated content. Moreover, providers are required to adopt measures across the full lifecycle of algorithm design, data training, and model deployment to prevent algorithmic discrimination based on ethnicity, religion, nationality, region, gender, or other protected characteristics.¹⁴⁶ In addition to generative AI, Chinese regulators also impose similar registration requirements on algorithm recommendation and deep synthesis services,¹⁴⁷ which altogether create a compliance network that compels companies to self-regulate prior to their deployment of AI services.

Readers may wonder how the regulators can ensure that generative AI produces only good or positive content and how AI service providers might achieve such control. In practice, AI providers are required to submit a range of materials, including an application form, a security self-assessment report, corpus annotation rules, a keyword

¹⁴³ Neil Guha, Christie M. Lawrence, Lindsey A. Gilmard, Kit T. Rodolfa, Faiz Surani, Rishi Bommasani, Inioluwa Deborah Raji, Mariano-Florentino Cuellar, Colleen Honigsberg, Percy Liang & Daniel E. Ho, *AI Regulation Has Its Own Alignment Problem: The Technical and Institutional Feasibility of Disclosure, Registration, Licensing, and Auditing*, 92 GEO. WASH. L. REV. 1473, 1508 (2024).

¹⁴⁴ Xinhua, *China Moves to Support Generative AI, Regulate Applications*, GOV.CN (July 13, 2023, at 21:01 CT), https://english.www.gov.cn/news/202307/13/content_WS64aff5b3c6d0868f4e8ddc01.html [https://perma.cc/6JHC-BNBH] (CAC officials noting that Generative AI like ChatGPT may cause problems of spreading fake information and infringing personal information and data safety).

¹⁴⁵ CAC, *supra* note 131.

¹⁴⁶ *Id.*

¹⁴⁷ Deep Synthesis Regulation, *supra* note 129; see Complete Compilation of 180 AI Policies in the First Half of 2024, *supra* note 137.

blocking list, and a testing dataset, in order to fulfill the registration.¹⁴⁸ For example, the keyword blocking list should contain at least ten thousand terms and cover seventeen categories of security risks outlined in the Basic Security Requirements for Generative AI Services [hereinafter The Basic Requirements].¹⁴⁹ Once submitted, these materials undergo both a documentation review and technical assessments by the local cyberspace administration. If approved, the materials are forwarded to the CAC for a second round of evaluation.¹⁵⁰ If the application is rejected at either stage, the provider must revise the submission or adjust the model's capabilities based on regulatory feedback before reapplying.¹⁵¹ Only upon final approval will the CAC issue a registration number, granting official permission to deploy the AI service. The registration requirement is also reinforced by a carrot-and-stick policy: local authorities offer incentives of up to 1 million renminbi (approximately \$138,705) to companies that complete the registration for the first time, encouraging compliance and participation.¹⁵² Meanwhile, companies or service providers that fail to register in accordance with the law will face a series of escalating penalties, from warnings, public reprimands, suspension of services, and fines, to, ultimately, revocation of their registration.¹⁵³

On the other hand, the Chinese government remains cautious of stifling the momentum of AI advancement. Articles 5 and 6 of the

¹⁴⁸ *China's New AI Regulations*, LATHAM & WATKINS, 5–6, 11–12, 17, 21 (Aug. 16, 2023), <https://www.lw.com/admin/upload/SiteAttachments/Chinas-New-AI-Regulations.pdf> [<https://perma.cc/HD98-7FEM>].

¹⁴⁹ Add Romanization (生成式人工智能服务安全基本要求) [Basic Security Requirements for Generative Artificial Intelligence Service], NAT'L TECH. COMM. 260 CYBERSECURITY STANDARDIZATION ADMIN. CHINA (Feb. 29, 2024), <https://www.tc260.org.cn/upload/2024-03-01/1709282398070082466.pdf> [<https://perma.cc/GU3Q-GAJ3>]. For English translation, see *Technical Documentation of National Technical Committee 260 on Cybersecurity of Standardization Administration of China: Basic Safety Requirements for Generative Artificial Intelligence Services*, CSET (Apr. 4, 2024), <https://cset.georgetown.edu/publication/china-safety-requirements-for-generative-ai-final/> [<https://perma.cc/84AC-3RU3>].

¹⁵⁰ *China's New AI Regulation*, *supra* note 148, at 9–10.

¹⁵¹ *Id.* at 10.

¹⁵² Guangzhoushi Haizhuqu Jianshe Rengongzhineng Damoxing Yingyong Shifanqu Shishi Xize (广州市海珠区建设人工智能大模型应用示范区实施细则) [Detailed Implementation Guidelines for the AI Large Model Application Pilot Zone in Haizhu District, Guangzhou], HAIZHU DIST. PUB. INFO. NETWORK (June 18, 2024), <https://www.haizhu.gov.cn/attachment/77629/7629106/9736917.pdf> [<https://perma.cc/RE48-C7EC>].

¹⁵³ The final version of the Generative AI Measures omits the specific monetary fines capped at 100,000 RMB (approximately US\$14,000) that were included in the draft. Instead, Article 21 introduces a tiered enforcement mechanism, outlining a range of escalating penalties depending on the severity of the violation. See *Comparison Chart of Current vs. Draft Rules for Generative AI*, CHINA L. TRANSLATE (July 13, 2023), <https://www.chinalawtranslate.com/comparison-chart-of-current-vs-draft-rules-for-generative-ai/> [<https://perma.cc/456P-LA2E>].

Generative AI Measures explicitly encourage technological innovation and advocate for multi-stakeholder collaboration across the AI ecosystem.¹⁵⁴ This reflects an understanding that technological progress is not a linear outcome of state directives, but rather a negotiated process shaped by institutional and technological actors. As a result, the Generative AI Measures are self-constrained in both scope and application. In contrast to the more stringent draft, the final version exempts certain categories of generative AI services, particularly those used privately or internally, and narrows its jurisdiction to providers who offer services to the public within China.¹⁵⁵ Article 17 further refines this scope by requiring security assessments and algorithmic filings only for generative AI services with “public opinion properties or the capacity for social mobilization.”¹⁵⁶ This nuanced distinction suggests that business-to-business services and consumer-facing tools without collective mobilization potential, such as translation software, travel planners, or productivity assistants, are largely exempt from regulatory filing requirements.¹⁵⁷ The exemptions reflect a technocratic yet flexible governance model that targets sensitive AI uses while preserving space for innovation in less politically charged domains.

The Generative AI Measures provide a clear case of governance by design, where legal frameworks are used to preconfigure technological development in line with state-defined imaginaries.¹⁵⁸ The regulatory design delicately intertwines China’s vision of becoming a global AI leader with a robust digital economy with the fears of causing insecurity and discrimination and losing governmental oversight.¹⁵⁹ In its essence, the Generative AI Measures aspires to cultivate an AI ecosystem that is not only lawful, but also ethically good and professionally rigorous. Registration, which reviews AI services *ex ante* and ensures adherence to legal and ethical standards, serves as a gateway to these future promises.

¹⁵⁴ CAC, *supra* note 131.

¹⁵⁵ The draft for the *Generative AI Measures* faced significant backlash upon its release for it imposed strict and infeasible requirements on generative AI services, and it was revised substantially in the final version. See CAC, *supra* note 140 (promulgating draft provisions that implement strict AI regulation through China).

¹⁵⁶ CAC, *supra* note 131.

¹⁵⁷ See Gilad Abiri & Yue Huang, *A Red Flag? China’s Generative AI Dilemma*, 37 HARV. J.L. & TECH. DIGEST, Fall 2023, at 18.

¹⁵⁸ See Deirdre K. Mulligan & Kenneth A. Bamberger, *Save Governance-by-Design*, 106 CALIF. L. REV. 697, 716 (2018).

¹⁵⁹ See Jasanoff & Kim, *supra* note 28, at 121.

C. COPRODUCED REGULATION: STATE-INDUSTRY SYMBIOSIS IN AI GOVERNANCE

Building on the governance-by-design approach, China's AI regulation also marks a shift in how regulatory power is distributed. From the internet boom of the late 1990s to the rise of blockchain technologies, technology regulation largely followed a top-down trajectory in China. In contrast, the current phase of AI regulation shows a more participatory and dynamic model. What distinguishes AI governance today is not only its embedded normative commitments, but also the growing involvement of private actors throughout the regulatory lifecycle. The coproductive mode, where state regulators, enterprises, and industry associations work together to shape the governance ecosystem, signals an evolution toward more collaborative governance.¹⁶⁰

1. *The Rise of Private Firms*

Since 2015, when innovation was officially positioned as the cornerstone of China's national development strategy,¹⁶¹ China's policy orientation has moved toward fostering an innovation-driven economy. In this context, empowering private stakeholders, especially major technology companies, has become a discernible trend in China's approach to technology regulation. As Michael E. Porter once cautioned, "government policies that succeed are those that create an environment in which companies can gain competitive advantage rather than those that involve government directly in the process."¹⁶² China appears to have taken this lesson to heart and begun to build an environment in which private firms do not merely comply with regulation but help design it.

This coproductive model has profoundly reshaped the dynamics between public authorities and private actors. The regulatory influence of Chinese tech giants, such as Tencent, Baidu, and Alibaba, is no longer peripheral but structurally embedded in the policymaking process,

¹⁶⁰ Katharine Vincent, Anna Steynor, Alice McClure, Emma Visman, Katinka Lund Waagsaether, Suzanne Carter & Neha Mittal, *Co-production: Learning from Contexts*, in CLIMATE RISK IN AFRICA: ADAPTATION AND RESILIENCE 37, 38–39 (Declan Conway & Katharine Vincent eds., 2021).

¹⁶¹ Xinhua, *China to Continue Innovation-Driven Development Strategy*, CHINA DAILY (Dec. 21, 2015, at 20:58 CT), https://europe.chinadaily.com.cn/china/2015-12/21/content_22767031.htm [<https://perma.cc/856Y-HYE8>].

¹⁶² Michael E. Porter, *The Competitive Advantage of Nations*, HARV. BUS. REV. (Mar.–Apr. 1990), <https://hbr.org/1990/03/the-competitive-advantage-of-nations> [<https://perma.cc/WY7W-CKM8>].

industry standard-setting, and even norm creation. For example, the term “deep synthesis” for deepfakes regulation originated from a suggestion by Tencent, emphasizing a more neutral descriptor, compared to the negative connotations associated with “deepfakes.”¹⁶³ Another example is the Basic Requirements, the standards for generative AI services registration. The detailed rules for self-assessment and keyword blocking were drafted by various stakeholders, including tech bigwigs like Huawei, Alibaba, and Baidu.¹⁶⁴ These firms are thus not only technology developers but also regulation designers and institutional collaborators. In this sense, sociotechnical imaginaries are no longer the exclusive domain of the state.¹⁶⁵ Instead, they are collectively coauthored by state and corporate actors who share, or strategically negotiate, visions of desirable futures shaped by emerging technologies, like AI here.¹⁶⁶ Through regulation, design, and deployment, both sides express and institutionalize their understandings of social life, political order, and economic aspiration in the algorithmic age.¹⁶⁷

2. The Case of CAV Regulation

The regulatory framework governing CAVs serves as a compelling illustration of innovation coproduced by state and industry actors. CAVs offer benefits such as road safety and efficiency, lower pollution, and enhanced traffic management.¹⁶⁸ Back in 2017, the AI Industry Development Action Plan articulated concrete goals for CAVs for the next three years.¹⁶⁹ By 2020, it sought to establish a secure, reliable,

¹⁶³ Sheehan, *supra* note 18, at 2, 30.

¹⁶⁴ Basic Security Requirements for Generative Artificial Intelligence Service, *supra* note 149, at 2.

¹⁶⁵ In their later book, Sheila Jasanoff and Sang-Hyun Kim noted that *sociotechnical imaginaries* are not confined to states as defined in their initial formulation but can be “articulated and propagated by other organized groups, such as corporations, social movements, and professional societies.” Sheila Jasanoff, *Future Imperfect: Science, Technology, and the Imaginations of Modernity*, in DREAMSCAPES OF MODERNITY: SOCIOTECHNICAL IMAGINARIES AND THE FABRICATION OF POWER 1, 4 (Sheila Jasanoff & Sang-Hyun Kim eds. 2015).

¹⁶⁶ *See id.*

¹⁶⁷ *See* Mager & Katzenbach, *supra* note 35, at 228–29 (discussing corporate sociotechnical imaginaries).

¹⁶⁸ James Marson, Jill Dickinson & Katy Ferris, *Regulating Connected and Autonomous Vehicles Through a Lens of Inclusivity*, 51 H.K.L.J. 983, 983–84 (2021).

¹⁶⁹ The *AI Industry Development Action Plan* focuses on innovative use cases, listing a series of AI-powered products and services that are designed to thrive in the next three years, covering healthcare, transportation, agriculture, finance, logistics, education, and culture industries. Cujin Xinyidai Rengong Zhineng Chanye Fazhan Sannian Xingdongjihua (促进新一代人工智能产业发展三年行动计划)[Three-Year Action Plan for Promoting the Development of Next Generation

and real-time intelligent platform for CAVs, define associated platform standards, and enable high-level autonomous driving capabilities.¹⁷⁰ In 2020, the Ministry of Industry and Information Technology (MIIT) released the *Technology Roadmap for Autonomous Vehicle 2.0*, setting the goal that the penetration rate of AVs is expected to be 50 percent in 2025 and 70 percent in 2030.¹⁷¹

Instead of imposing a rigid, comprehensive legal framework on CAVs, Chinese regulators adopt a dynamic, multi-layered regime that evolves in tandem with technological progress.¹⁷² Since 2020, dozens of policies have been introduced, spearheaded by a coalition of administrative bodies including the MIIT. These measures address a broad spectrum of concerns, from liability allocation and infrastructure planning to standards development and pilot zone coordination.¹⁷³ One of the most emblematic examples of these initiatives is the 2024 program jointly launched by MIIT and four other agencies, which selected twenty cities to trial the integration of CAVs, roads, and cloud-based systems.¹⁷⁴ The aim

Artificial Intelligence Industry (2018-2020)] (promulgated by the Ministry of Industry and Information Technology [MIIT], Dec. 13, 2017, effective Dec. 31, 2017), at 1, https://www.cac.gov.cn/2017-12/15/c_1122114520.htm [<https://perma.cc/U8ZU-N9RF>].

¹⁷⁰ *Id.*

¹⁷¹ Hong Tan, Fuquan Zhao, Zongwei Liu & Haokun Song, *Effects of Nine Typical Technologies for Primary Autonomous Vehicles on Road Safety in China*, 26 *ISCIENCE*, Feb. 6, 2023, at 1–2.

¹⁷² Zhihuichuxing yu Cheluyun Yitihua Zhengce Yanjiu Baogao (《智慧出行与车路云一体化政策研究报告》) [Research Reports on Smart Mobility and Integrated Vehicle-Road-Cloud Policies], CHINA ITS INDUS. ALL. (Jan. 23, 2025), <https://www.c-its.org.cn/Uploads/ueditor/file/20250124/6793344279e70.pdf> [<https://perma.cc/DPY6-JETX>].

¹⁷³ See, e.g., *Policy to Promote Autonomous Driving*, CHINA DAILY (Jan. 5, 2021, at 07:07 CT), https://english.www.gov.cn/policies/policywatch/202101/05/content_WS5ff39f9fc6d0f725769433b4.html [<https://perma.cc/T4ZJ-SYQM>] (discussing a set of measures that have been passed in China to promote the growth of autonomous driving); Mingyan Nie & Yuan Shen, *Autonomous Driving in China*, in *AUTONOMOUS VEHICLES AND CIVIL LIABILITY IN A GLOBAL PERSPECTIVE* 125, 136–40 (Hans Steege et al. eds., 2024) (introducing the laws on AV liabilities and listing the existing laws, regulations, and rules on autonomous driving in China); Johannes Deichmann, Martin Kellner, Bill Peng, Sijia Wang & Ting Wu, *From Sci-fi to Reality: Autonomous Driving in China*, MCKINSEY & CO. (Jan. 3, 2023), <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/from-sci-fi-to-reality-autonomous-driving-in-china> [<https://perma.cc/2D8G-CHFL>] (analyzing the regulatory framework for autonomous driving in China).

¹⁷⁴ Wubuwei Guanyu Kaizhan Zhineng Wanglian Qiche “Cheluyunyitihua” Yingyong Shidian Gongzuo de Tongzhi (五部委关于开展智能网联汽车“车路云一体化”应用试点工作的通知) [Notice from Five Ministries on Launching Pilot Applications for Integrated Vehicle-Road-Cloud Systems in Intelligent Connected Vehicles], MIIT (Jan. 15, 2024), https://www.gov.cn/zhengce/zhengceku/202401/content_6926711.htm [<https://perma.cc/PK64-VYQW>]; Cao Yingying, *Vehicles, Road and Cloud Key to Future of Driving*, CHINA DAILY (Aug. 26, 2024, at 09:32 CT), <https://www.chinadaily.com.cn/a/202408/26/WS66c6db3fa31060630b924e28.html> [<https://perma.cc/55XV-H7AJ>].

is to foster a harmonized ecosystem in which intelligent vehicles, responsive infrastructure, and real-time data flows interact seamlessly to support large-scale adoption.¹⁷⁵ At the time of writing, ninety-three pilot projects are underway nationwide, ranging from shared-driving schemes to fully driverless operations.¹⁷⁶ As of 2024, Baidu operates driverless taxis across thirty-three public roads in Beijing and has launched one of the world's largest autonomous driving experiments with over five hundred robotaxis deployed in Wuhan.¹⁷⁷

Local governments, in turn, play an instrumental role in institutionalizing these innovations. In Shenzhen, a regulatory framework for deploying self-driving buses has been in place since 2018,¹⁷⁸ and AVs have been legally permitted on public roads since 2021.¹⁷⁹ In Beijing, a landmark piece of legislation, the Beijing Autonomous Vehicle Regulation, was passed in December 2024 to support the commercial rollout of level three and higher AVs.¹⁸⁰ This regulation establishes clear operational guidelines, including market entry thresholds and safety requirements such as platform-based monitoring.¹⁸¹

¹⁷⁵ Notice from Five Ministries on Launching Pilot Applications for Integrated Vehicle-Road-Cloud Systems in Intelligent Connected Vehicles, *supra* note 174.

¹⁷⁶ Trefor Moss, *China Auto Exec on Self-Driving Cars: 'You Can't Just Put Some Sensors on Top'*, WALL ST. J. (Mar. 29, 2018, at 18:38 ET), <https://www.wsj.com/articles/china-auto-exec-on-self-driving-cars-you-cant-just-put-some-sensors-on-top-1522327226> [https://perma.cc/4Y4L-PAR2].

¹⁷⁷ *Id.*; Jennifer Zhu Scott, *Understanding China's Pragmatic AI Plan*, FIN. TIMES (July 31, 2024), <https://www.ft.com/content/e76d54e6-607f-4511-a2dc-db030feca0b9> [https://perma.cc/36MZ-ZBJ2].

¹⁷⁸ Chen Ziyang & Liu Shiguo, *China's Self-driving Car Legislation Study*, 41 COMPUT. L. & SEC. REV., at 5 (2021).

¹⁷⁹ Brittany Eastman, Shay Collins, Ryan Jones, JJ Martin, Marjory S. Blumenthal & Karlyn D. Stanley, *A Comparative Look at Various Countries' Legal Regimes Governing Automated Vehicles*, 2023 J.L. & MOBILITY 1, 11 (2023) (discussing the testing practices of automated public transportation systems in the Shenzhen region).

¹⁸⁰ Lingyun Yu, Qin Zhu & Lin Zheng, *Autonomous Vehicles Regulation in Beijing*, 17 TSINGHUA CHINA L. REV. 131 (discussing the Beijing regulatory practices on autonomous driving); *China Focus: China Strengthens Support for Autonomous Driving Technology as Beijing Passes New Regulations*, XINHUA (Dec. 31, 2024, at 17:04 CT), <https://english.news.cn/20241231/47da2f242a6c47c49720fb6823df60e8/c.html> [https://perma.cc/ZY77-XE8B]; see generally Lingyun Yu, Qin Zhu & Lin Zheng, *Autonomous Vehicles Regulation in Beijing*, 17 TSINGHUA CHINA L. REV. 131 (discussing the Beijing regulatory practices on autonomous driving).

¹⁸¹ Beijing shi Zidongjiaoshi Qiche Tiaoli (北京市自动驾驶汽车条例) [Beijing Autonomous Vehicle Regulations] (promulgated by the Standing Comm. of the 16th Beijing Mun. People's Cong., Dec. 31, 2024, effective Apr. 1, 2025), art. 23–27, 37, STANDING COMM. BEIJING MUN. PEOPLE'S CONG. (Dec. 31, 2024), https://www.bjrd.gov.cn/zyfb/202501/t20250102_3979083.html [https://perma.cc/EEX5-E68H].

Backed by strong state ambition, China's tech sector has made remarkable strides in advancing AV technology. Since 2017, Baidu, a leader in China's AV field, has funneled billions into its autonomous driving fund, while EV manufacturer BYD Auto recently pledged a \$14 billion investment to accelerate its AV capabilities.¹⁸² Today, model development in China is estimated to be 30 percent faster than that of legacy automotive players, and over 60 percent of new EVs sold domestically are equipped with advanced driver-assistance systems.¹⁸³ According to McKinsey & Co., China is poised to become the world's largest AV market, with projected revenues from AVs and related mobility services estimated to exceed \$500 billion by 2030.¹⁸⁴

Moreover, enterprises have become central nodes in the evolving regulatory assemblage of CAVs. Leading AV manufacturers such as BYD, Xiaopeng, Baidu, and Geely do more than drive technological innovation, but actively participate in defining the institutional architectures within which such innovations are to be governed. They are principal drafters of technical standards, safety protocols, road tests, and performance benchmarks,¹⁸⁵ coding their epistemic authority into the normative scaffolding of the CAV regime. Their influence transcends the economic sphere, extending into regulatory and political domains. This boundary-crossing role is particularly salient, where high-level executives

¹⁸² June Yoon, *Connected Cars Pose Real Risks as Use of Specialised Software Grows: Inside Business Asia*, FIN. TIMES (Oct. 2, 2024), <https://www.ft.com/content/cee6b772-508d-438c-925a-d415e867b1f5> [https://perma.cc/P9W9-HXVT].

¹⁸³ *Id.*

¹⁸⁴ Luca Pizzuto, Christopher Thomas, Arthur Wang, & Ting Wu, *How China Will Help Fuel the Revolution in Autonomous Vehicles*, MCKINSEY & CO. (Jan. 25, 2019), <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/how-china-will-help-fuel-the-revolution-in-autonomous-vehicles#/> [https://perma.cc/BK39-BV4W].

¹⁸⁵ E.g., *GBT 44721-2024 Intelligent and Connected Vehicles: General Requirements for Automated Driving Systems* (promulgated by the MIIT, Sept. 29, 2024, effective Sept. 29, 2024) State Admin. for Mkt. Regul. and Standardization Admin. of China, <https://openstd.samr.gov.cn/bzgk/std/newGbInfo?hcno=8AA1E95193C35E2BFF390DBE5B986DE8> [https://perma.cc/6MQ5-5WDC]; *GB/T 44461.1-2024 Intelligent and Connected Vehicle—Technical Requirements and Testing Methods for Combined Driver Assistance System—Part 1: Single-Lane Manoeuvre*, (promulgated by the MIIT, Aug. 23, 2024, effective Aug. 23, 2024) State Admin. for Mkt. Regul. and Standardization Admin. of China, <http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=910258FCFC590EA5683F802E3557D319> [https://perma.cc/V3AQ-2J9G]; *GB/T 44719-2024 Intelligent and Connected Vehicle—Methods and Requirements of Road Test for Automated Driving Functions*, (promulgated by the MIIT, Sept. 29, 2024, effective Sept. 29, 2024) State Admin. for Mkt. Regul. and Standardization Admin. of China, <http://c.gb688.cn/bzgk/gb/showGb?type=online&hcno=DF51C63EDC1CA8E878CE822FE3E34093> [https://perma.cc/8PKW-4NF7].

of major tech companies often hold formal political positions.¹⁸⁶ It is common for CEOs of leading auto firms to serve as members of the Chinese People's Political Consultative Conference (CPPCC) or deputies to the National People's Congress, institutionalizing their input into national policymaking.¹⁸⁷ Robin Li, Chairman and CEO of Baidu and a CPPCC member, provides a telling example. At the annual sessions of the National People's Congress and CPPCC, he has consistently proposed legislative reforms to support the commercialization of level four AVs and advocated for infrastructure enhancements to enable a more intelligent transport ecosystem.¹⁸⁸

Therefore, private actors, or more precisely, big tech firms, have been playing an increasingly central role in China's techno-pragmatic governance. Frank Pasquale once characterized this trend as "functional sovereignty," describing how corporations like Amazon and Apple wield expansive powers that allow them to operate as de facto sovereigns, often encroaching upon the traditional domain of state regulators.¹⁸⁹ While this dynamic is tempered in China, it nevertheless demonstrates the nation's evolving regulatory climate: the rise of Chinese tech giants has significantly altered the balance between public regulation and private power in the technology sector.¹⁹⁰ Together, regulators and corporate actors collaboratively define and stabilize sociotechnical imaginaries—futures in which emerging technologies are rendered not only technologically viable but also socially and politically legitimate.

¹⁸⁶ Yueqi Wang, Shouming Chen & Peien Chen, *CEO Political Connections and OFDI of Chinese Firms Under the Belt and Road Initiative*, 11 HUM. & SOC. SCI. COMMUN, Sept. 2, 2024, at 2–3; Russell Fralich & Hong Fan, *Legislative Political Connections and CEO Compensation in China*, 17 ASIAN BUS. & MGMT. 112, 112 (2018).

¹⁸⁷ *See Auto Executives Submit Proposals on Tech and Data Security to Two Sessions*, CHINA DAILY (June 4, 2023, at 10:22 CT), <https://www.chinadailyhk.com/hk/article/159779> [<https://perma.cc/TN2D-D3BJ>].

¹⁸⁸ Liu Jia, *Baidu's Robin Li to Propose Setting Up Pilot Zones for Self-Driving Vehicles*, YICAI (Mar. 4, 2022), <https://www.yicaiglobal.com/news/baidu-robin-li-to-propose-setting-up-pilot-zones-for-self-driving-vehicles> [<https://perma.cc/KU42-UDBC>].

¹⁸⁹ Frank Pasquale, *New Economic Analysis of Law: Beyond Technocracy and Market Design*, 5 CRITICAL ANALYSIS L. 1, 12 (2018) ("In neither case are we dealing with classic interactions within a market—rather, we are facing an increasingly political economy, where power is exercised by firms, in a legal environment that firms themselves also shaped").

¹⁹⁰ YA-WEN LEI, *THE GILDED CAGE: TECHNOLOGY DEVELOPMENT, AND STATE CAPITALISM IN CHINA* 176–80 (2023) (discussing the increasing political influence enjoyed by China's big tech companies). To delve deeper into the love-hate relationship between Chinese government and big tech companies, *see generally*, ANGELA HUYUE ZHANG, *HIRE WIRE: HOW CHINA REGULATES BIG TECH AND GOVERNS ITS ECONOMY* (2024) (discussing the complex relationship between the Chinese government and tech companies); Angela Huyue Zhang, *Agility Over Stability: China's Great Reversal in Regulating the Platform Economy*, 63 HARV. INT'L L.J. 457, 474–94 (2022).

III. BEYOND TECHNOCRATIC PRAGMATISM: REGULATING FOR STAKEHOLDERS EMPOWERMENT

China's regulation of AI exemplifies its broader approach to emerging technologies: prioritizing state–industry collaboration to drive innovation and economic growth. This Part shifts its focus to the sidelined imaginaries: safety, accountability, and democratic deliberation, which are widely held but largely excluded from current laws and policies. It discusses how techno-pragmatic governance, while enabling rapid progress and state control, has marginalized critical voices and failed to fully protect public interests. Underrepresented stakeholders remain largely absent from the regulatory process. This Part maps their roles and expectations, exposing systemic gaps in participatory capacity and arguing for stakeholder empowerment as a foundational principle for more inclusive and robust regulation.

A. THE COST OF DOMINANT IMAGINARIES

To understand how regulatory priorities are shaped and contested, and how some values and desires override others in China's technology governance, this Article again turns to sociotechnical imaginaries as a heuristic tool. In China, the imaginaries surrounding emerging technologies, as articulated through national policies, official discourse, and legal mandates, are those of efficiency, innovation, prosperity, and robust state control.¹⁹¹ However, sociotechnical imaginaries are neither monolithic nor static, but multiple, contested, and constantly in flux.¹⁹² In fact, “any collective is a reservoir of coexisting and often competing norms, values, desires, and thus imaginaries.”¹⁹³ In the realm of digital technologies, such contestation is particularly visible, as various actors bring divergent expectations and priorities to the table.¹⁹⁴ As STS literature suggests, the larger the collective (like a nation-state) and the closer it is to powerful instruments of meaning-making (like technical expertise) and goal-setting (such as political authority), the more likely its preferred

¹⁹¹ See *supra* Part II.B–C. Jascha Bareisl & Christian Katzenbach, *Talking AI into Being: The Narratives and Imaginaries of National AI Strategies and Their Performative Politics*, 47 SCI., TECH., & HUM. VALUES 855, 869 (2022).

¹⁹² Mager & Katzenbach, *supra* note 35, at 226.

¹⁹³ Magdalena Kuchler & Gubb Marit Stigson, *Unravelling the ‘Collective’ in Sociotechnical Imaginaries: A Literature Review*, 110 ENERGY RSCH & SOC. SCI., 2024, at 14.

¹⁹⁴ Mager & Katzenbach, *supra* note 35, at 227.

sociotechnical imaginaries will prevail and become institutionalized.¹⁹⁵ In China, widely shared imaginaries, centered on safety, privacy, and equity, held among individual users, are routinely overshadowed by dominant narratives, the latter leaving little space for alternative perspectives to influence law and policy.¹⁹⁶

Take CAVs as an illustration. In China, the dominant sociotechnical imaginaries surrounding CAVs emphasize efficiency, convenience, and innovation. These imaginaries are not confined to the state or tech industry but shared by the public, who face daily realities of road congestion and traffic fatalities. According to the World Health Organization, 716 people died on China's roads daily as of five years ago, compared to ninety-three in the US.¹⁹⁷ In this context, AVs are popularly imagined as a technological salvation. A 2017 J.D. Power survey found that Chinese consumers' top perceived benefits of self-driving cars include the ability to engage in other activities while driving (34 percent) and reduced driving stress (33 percent).¹⁹⁸ These shared imaginaries have enabled rapid AV development and commercialization. Car manufacturers, capitalizing on the tech-optimistic public, have promoted increasingly autonomous features, reshaping not only vehicle design, but also urban planning and social habits.¹⁹⁹ As discussed above, national and local policies on CAVs are largely promotional, designed to accelerate the rollout of the technology.²⁰⁰ It is thus unsurprising that imaginaries of efficiency and innovation have gained prominence, given their proximity to key resources, institutional authority, and policy agendas. Nonetheless, this near-utopian narrative of CAVs masks significant risks, particularly when manufacturers manipulate the collectively held expectations to conduct trust-destroying practices.²⁰¹

¹⁹⁵ Kuchler & Stigson, *supra* note 193.

¹⁹⁶ Roberts et al., *supra* note 37.

¹⁹⁷ Moss, *supra* note 176.

¹⁹⁸ Jacob George & Flora Niu, *Mobility Disruptors: China Consumers Raise Their Hand High for Autonomous Vehicles*, J.D. POWER (Nov. 12, 2017), <https://www.jdpower.com/business/resources/mobility-disruptors-china-consumers-raise-their-hand-high-autonomous-vehicles> [<https://perma.cc/36S7-PHUZ>].

¹⁹⁹ See Axelle Van Wynsberghe & Ângela Guimarães Pereira, *The Politics and Imaginary of 'Autonomous Vehicles': A Participatory Journey*, 9 HUMANITIES & SOC. SCI. COMM'NS, 2022, at 2.

²⁰⁰ See *supra* Part II.C.2.

²⁰¹ See Jan-Luuk Hoff, *Unavoidable Futures? How Governments Articulate Sociotechnical Imaginaries of AI and Healthcare Services*, FUTURES, Mar. 3, 2023, at 1, 4, 11.

The fatal crash of a Xiaomi SU7 in March 2025 offers a sobering counterpoint. Operating under its Navigate on Autopilot system,²⁰² the vehicle failed to avoid a temporary construction barrier, resulting in the deaths of all three young passengers, while the car caught fire and burned.²⁰³ Post-accident analysis revealed critical limitations in the vehicle's "pure vision" system, which struggled to detect roadblocks that were not mapped.²⁰⁴ There were only two seconds between system alert and manual takeover, which is arguably insufficient for human drivers to respond meaningfully in real-world scenarios.²⁰⁵ The technical shortcomings were compounded by advertisements that exaggerated the vehicle's automation level. Marketed as "smart driving," the SU7 in fact qualifies only as level two, a classification that still requires constant supervision.²⁰⁶ Further safety concerns arose when it was reported that passengers may have been trapped inside the wreckage due to the failure of its electronic door system.²⁰⁷ While Xiaomi later clarified that mechanical door-release levers were installed beneath interior compartments, their obscure placement reveals a deeper design failure—one that privileges sleek form over intuitive safety and emergency preparedness.²⁰⁸ The fire following the accident also raises concerns about the risks of EVs. In the first quarter of 2022, 640 EVs caught on fire in China, a year-on-year increase of 32 percent.²⁰⁹ The tragedy exposes the

²⁰² H Hao, *Xiaomi SU7 Crash on Highway Leaves Three Dead Raises Questions About Smart Driving Safety and System Response*, CTOL DIGIT. SOLS. (Apr. 1, 2025), <https://www.ctol.digital/news/xiaomi-su7-crash-smart-driving-safety/> [<https://perma.cc/7GJE-5XMC>].

²⁰³ Huang Lin, *Families Demand Answers After Fatal Xiaomi SU7 Crash*, YICAI GLOB. (Apr. 2, 2025), <https://www.yicaiglobal.com/news/families-demand-answers-after-fatal-xiaomi-su7-crash> [<https://perma.cc/CJZ5-Q89P>].

²⁰⁴ *Id.*

²⁰⁵ Hao, *supra* note 202.

²⁰⁶ Zhang Wanshi & Li Yawei, *Fatal Highway Accident Sparks Smart Driving Safety Debate on Social Media; Expert Suggests to Reduce Reliance*, GLOB. TIMES (Apr. 2, 2025, at 23:04 CT), <https://www.globaltimes.cn/page/202504/1331423.shtml> [<https://perma.cc/V5DA-A239>].

²⁰⁷ Lin, *supra* note 203.

²⁰⁸ Hao, *supra* note 202. It was not the only accident that arises from the failure of concealed door handles. In 2024, an Aito M7 electric SUV collided with a truck and erupted into flames, killing all three passengers, including a two-year-old child. Investigations later revealed that the concealed door handles did not eject after the crash, preventing timely rescue. Boetius, *Family Raises Questions After Fatal Collision: Huawei Wenjie M7 Crash into Water Truck*, CMGM (Apr. 29, 2024), <https://www.cmgm.net/huawei-wenjie-m7-crash-into-water-truck/> [<https://perma.cc/RZQ6-F5Y5>].

²⁰⁹ Dong Yi Chen, *Chinese Electric Vehicles Are on Fire*, CARNEWSCHINA (Apr. 18, 2022, at 13:38 CEST), <https://carnewschina.com/2022/04/18/chinese-electric-vehicles-are-on-fire/> [<https://perma.cc/CX3Z-MRMT>].

disjuncture between imagined futures of seamless automation and the lived realities of risk and vulnerability.

The Xiaomi tragedy was not an isolated incident. Comparable accidents have unfolded without prompting meaningful regulatory change.²¹⁰ The difference in 2025 was the grassroots backlash on social media, where public anger over safety, algorithmic flaws, and deceptive promotion reached a critical mass.²¹¹ In this moment of rupture, marginalized imaginaries that emphasize safety, transparency, and accountability began to emerge. The backlash exposed not only the fragility of public trust, but also the cost of existing dominant imaginaries embedded in China's technocratic governance. In the aftermath of the accident, vehicle regulators finally began tightening oversight of AVs, signaling an end to the regulatory Wild West that had long prevailed.²¹²

As the preceding case illustrates, the dominant sociotechnical imaginaries for emerging technologies invite two main pitfalls. Jasanoff and Kim have observed that while imaginaries do not dictate policy outcomes, they serve as powerful cultural resources that shape how societies interpret and respond to technological innovation.²¹³ In China, the dominant imaginaries of efficiency, innovation, and progress have not only lent legitimacy to certain commercial practices but have also guided regulatory agendas. Tech companies continuously feed on, manipulate, and at times exploit these imaginaries, resulting in trust-destroying behaviors. The AV advertisements often outpace technical reality,

²¹⁰ For example, in 2024, a self-driving Robotaxi developed by Baidu struck a pedestrian in Wuhan. *A Driverless Car Hits a Person Crossing Against the Light in China*, AP NEWS (July 10, 2024, at 12:17 CT), <https://apnews.com/article/china-autonomous-driving-accident-baidu-b0b4527ff355836f2df03868ff0bd0fc> [<https://perma.cc/KG3D-F8EU>]. That same year, an Aito M7 Plus electric SUV, operating under an advanced driver assistance system, crashed on a highway in Shanxi Province, resulting in the deaths of three individuals. Keith Bradsher, *How Safe Are Driverless Cars in China? I Rode in Some to See.*, N.Y. TIMES (June 13, 2024), <https://www.nytimes.com/2024/06/13/business/china-driverless-car-safety.html> [<https://perma.cc/V62Y-NTKY>].

²¹¹ See Zhang & Li, *supra* note 206; Jiahui Huang, *Xiaomi's Shares Fall After Fatal Car Accident Involving One of Its EVs*, WALL ST. J. (Apr. 1, 2025, at 05:21 ET), <https://www.wsj.com/business/autos/xiaomi-stock-ev-company-fatal-accident-b7cb61cf> [<https://perma.cc/T7EL-6D63>].

²¹² Yoko Kubota, *China Pushed a Hard Sell on Autonomous Driving. After a Deadly Crash, It's Pulling Back.*, WALL ST. J. (Apr. 29, 2025, at 05:30 ET), <https://www.wsj.com/business/autos/china-pushed-a-hard-sell-on-autonomous-driving-after-a-deadly-crash-its-pulling-back-b12072e3> [<https://perma.cc/2CZK-TMJ3>]; Edward White & Gloria Li, *Chinese Regulators Seek to Slow Rollout of Self-Driving Features in Cars*, FIN. TIMES (June 7, 2025), <https://www.ft.com/content/cf72f1c1-7495-461f-8c1c-790016fad647> [<https://perma.cc/4AGL-MZ3A>].

²¹³ Jasanoff & Kim, *supra* note 30.

marketing functionalities that exceed actual affordances and overstating the level of automation.²¹⁴ Phrases like “smart driving” and “self-driving” were widely used in marketing campaigns for level two vehicles, obscuring the vehicles’ true functional limitations.²¹⁵ As Miao Wei, former Minister of MIIT, has criticized, many firms prioritize “smart” branding over foundational safety.²¹⁶ These exaggerations are not merely semantic; they shape public expectations, influence regulatory leniency, and ultimately compromise consumer protection.

On the other hand, dominant imaginaries often eclipse alternative visions rooted in equity, privacy, and safety—concerns that receive inadequate attention in the existing regulatory framework. Consider, for instance, scenarios involving extreme weather that may severely impair autonomous navigation or emergencies requiring immediate human response. Regardless of automation level, autonomous and semiautonomous vehicles must be capable of interacting safely and effectively with law enforcement, emergency personnel, and other authorized actors.²¹⁷ However, the essential requirement remains conspicuously underdeveloped in the state’s current regulations. Beijing Autonomous Vehicle Regulation, for example, merely stipulates that “in the event of a traffic accident involving a self-driving car, the driver or security personnel and platform security monitoring personnel shall take necessary safety disposal measures in accordance with the regulations.”²¹⁸ This provision neither articulates the minimum standards for emergency

²¹⁴ *China Bans ‘Smart’ and ‘Autonomous’ Driving Terms from Vehicles Ads*, REUTERS (Apr. 18, 2025, at 10:33 CT), <https://www.reuters.com/business/autos-transportation/china-bans-smart-autonomous-driving-terms-vehicle-ads-2025-04-17/> [<https://perma.cc/JTM6-MB4G>].

²¹⁵ *Id.*

²¹⁶ Lin, *supra* note 203.

²¹⁷ For reference, Australia’s proposed *Automated Vehicle Safety Laws* would require law enforcement and emergency service personnel to know the following:

How an Automated Driving System (ADS) recognizes law enforcement and emergency services on the road or at the roadside.

How to intercept, direct, or disengage an ADS, if necessary (and when authorized to do so).

How to access ADS data (where authorized).

How to safely interact with an automated vehicle at a crash scene (including how to safely remove or tow an automated vehicle when it is creating an obstruction to traffic).

Law Enforcement and Emergency Services Interaction Protocol, NAT’L TRANSP. COMM’N (Apr. 2024) (Austl.),

<https://www.ntc.gov.au/sites/default/files/assets/files/LEESIP%20April%202024.pdf> [<https://perma.cc/T3ZX-EQWR>].

²¹⁸ Beijing Autonomous Vehicle Regulations, *supra* note 181.

protocols nor mandates periodic updates of protocols to ensure systematic safety.²¹⁹

Moreover, in the wake of the Xiaomi accident, *China Daily*, the official state media in China, reported that only 25 percent of AV users had received adequate training, while 41 percent had never undergone any training at all.²²⁰ Meanwhile, the installation of level 2.5 advanced driver-assistance systems has surged by 175 percent year-on-year, and by 2024, the penetration rate of advanced autonomous driving features had reached 11.4 percent in China's domestic passenger car market.²²¹ Despite this rapid expansion, there is a striking regulatory void: there are no mandatory requirements for user education, training, or certification under existing Chinese laws and policies. As local governments race to establish pilot zones and accelerate the rollout of AV services, public safety is increasingly relegated, if not outright neglected, at the altar of innovation and economic growth.²²² These regulatory omissions are not merely technical lapses; they expose the struggle of sidelined sociotechnical imaginaries to assert influence within a governance landscape dominated by technocratic pragmatism and market imperatives.

Through the lens of sociotechnical imaginaries, an examination of China's techno-pragmatic governance provides a cautionary tale: When regulatory priorities are shaped primarily by the pursuit of innovation and market scalability, foundational values such as safety, equity, and privacy may be treated as externalities to be dealt with after harm has occurred.

²¹⁹ See *id.*

²²⁰ Zhao Yimeng, *Fatal Car Crash in Anhui Raises Public Concern over Use of Smart Driving*, CHINA DAILY (Apr. 3, 2025, at 08:57 CT), <https://www.chinadaily.com.cn/a/202504/03/WS67eddce7a3104d9fd381d655.html> [https://perma.cc/G6DU-WCPS].

²²¹ *Goals & Resources*, SAVE-US, <https://safeavs.com/goals-resources/> (last visited Apr. 15, 2026); Level 2.5 refers to a transitional level of driving automation, more advanced than traditional Level 2 systems but still requiring full driver oversight, typically featuring enhanced Navigate-on-Autopilot (NOA) capabilities, lane changes, and automated highway entry and exit. The very notion of Level 2.5 reflects the regulatory ambiguity and standard-setting disorder in China's AV market. *China Automotive Intelligent Driving Market Report 2024 - ECARX Leads Surge in Intelligent Driving with 175% Growth in L2.5 ADAS Installations Amidst Expanding Chinese Market*, GLOBE NEWSWIRE (June 7, 2024, at 05:39 ET), <https://www.globenewswire.com/news-release/2024/06/07/2895261/28124/en/China-Automotive-Intelligent-Driving-Market-Report-2024-ECARX-Leads-Surge-in-Intelligent-Driving-with-175-Growth-in-L2-5-ADAS-Installations-Amidst-Expanding-Chinese-Market.html> [https://perma.cc/6G8Y-5WCH]; *China and Global Automotive High-precision Positioning Research Report 2025 Featuring Installation Forms and Data of 7 OEMs, 30 Chinese High-precision Positioning Suppliers and 4 Module Suppliers*, YAHOO FINANCE (Apr. 9, 2025), <https://finance.yahoo.com/news/china-global-automotive-high-precision-080100096.html> [https://perma.cc/3MBP-B742].

²²² See Bradsher, *supra* note 210.

Even though the state and tech giants increasingly coproduce the architecture of technological systems, a critical constituency—ordinary citizens—remain marginalized. Their marginalization is not a matter of numbers but of power, access, resources, and expertise. Their voices are not insured in the exponential growth of emerging technologies, with their rights and lived experiences overridden by a potentially conflicting dominant vision. In response, the next Part calls for a shift toward participatory governance in which citizens actively participate in the entire regulatory lifecycle and have a direct role in shaping public policies, programs, and initiatives.²²³

B. RECLAIMING PARTICIPATORY CAPACITY

Participatory governance refers to a decision-making framework that prioritizes the meaningful engagement of citizens in shaping, executing, and assessing public policies.²²⁴ In the regime of emerging technologies, it foregrounds democratic legitimacy and enhances the regulatory capacity to anticipate and respond to complex, evolving technological risks. As this Part argues, it is not only normatively desirable, but functionally essential.

First and foremost, governance is not merely about formal rules or institutional actors but also about who gets to imagine and coproduce the future.²²⁵ Public engagement is not simply instrumental as a means to achieve predefined policy goals, but normative in nature.²²⁶ It is about surfacing matters of concern, uncovering values, and articulating visions of what kind of technological future a society wants to live in.²²⁷ In this sense, participatory governance is underpinned by the idea that those most affected by a problem deserve a meaningful role in shaping its solution.²²⁸

²²³ See generally Fischer, *supra* note 40 (explaining the theory of participatory governance).

²²⁴ Nick Jain, *What is Participatory Government? Definition, Model, Importance, and Examples*, IDEASCALE (Mar. 22, 2024), <https://ideascale.com/blog/what-is-participatory-government/> [<https://perma.cc/DZK6-AYQ3>].

²²⁵ Ulicane et al., *supra* note 123, at 160–61. See Black, *supra* note 40, at 108.

²²⁶ See Lobel, *supra* note 40, at 373–76.

²²⁷ See Wynsberghe & Pereira, *supra* note 199, at 3.

²²⁸ Archon Fung & Erik Olin Wright, *Thinking about Empowered Participatory Governance*, in DEEPENING DEMOCRACY: INSTITUTIONAL INNOVATIONS IN EMPOWERED PARTICIPATORY GOVERNANCE 3, 26 (Archon Fung & Erik Olin Wright eds., 2003) (“A classic justification for democratic rule over paternalist or otherwise exclusive modes is that a decision is more likely to treat those affected by it fairly when they exercise input”); Jaime Alison Lee, *Can You Hear Me Now?: Making Participatory Governance Work for the Poor*, 7 HARV. L. & POL’Y REV. 405, 406 (2013).

This is particularly salient in the governance of emerging technologies.²²⁹ When citizens are 24/7 users of AI-powered applications, from AVs to facial recognition systems, their lived experiences and concerns are not peripheral but become central in the policymaking process. Law, therefore, serves a facilitative role in creating deliberative spaces and devising suitable procedures that will foster participatory dialogue.²³⁰ In the existing regulatory landscape, China has made much progress in expanding participatory mechanisms, like opening public comment periods on draft regulations.²³¹ However, these mechanisms remain limited and technocratic in practice. For example, most AI regulations allow public feedback during the draft stage, but this is an opportunity for only limited input and saved for stakeholders with sufficient legal and technical knowledge, such as big tech companies.²³² Public feedback windows are also short, lasting around thirty days.²³³ Apart from online consultation, Chinese citizens have limited channels to file complaints and express concerns to the government.²³⁴ As Roger C. Cramton comments: “Governmental agencies rarely respond to interests

²²⁹ See Gilman, *supra* note 42, at 505–06.

²³⁰ BRONWEN MORGAN & KAREN YEUNG, AN INTRODUCTION TO LAW AND REGULATION 42 (2007) (noting that law has the role of “establishing and maintaining the boundaries of a space for free and secure interaction between regulatory participants”).

²³¹ JAMIE P. HORSLEY, PUBLIC PARTICIPATION IN THE PEOPLE’S REPUBLIC: DEVELOPING A MORE PARTICIPATORY GOVERNANCE MODEL IN CHINA 13 (Sep. 2009), https://law.yale.edu/sites/default/files/documents/pdf/Intellectual_Life/CL-PP-PP_in_the_PRC_FINAL_91609.pdf [<https://perma.cc/SK9M-7SBL>].

²³² See Roberts et al., *supra* note 37, at 93. (“[W]ith a restricted interest group ecosystem, the ability to feed meaningfully into future AI policy documents is necessarily constrained.”).

²³³ For instance, data from the CAC’s consultation page shows that both the Generative AI Measures and the AI labeling policy were open for public comment for a period of thirty days. See Steven J. Balla & Zhouan Xie, *Notice and Comment Policymaking in China: What Has Changed at the Vanguard?*, GEO. WASH. REGUL. STUD. CTR. (Oct. 20, 2021), <https://regulatorystudies.columbia.gwu.edu/notice-and-comment-policymaking-china> [<https://perma.cc/3796-7WK8>].

²³⁴ Baogang He & Mark E. Warren, *Authoritarian Deliberation: The Deliberative Turn in Chinese Political Development*, 9 PERSPS. ON POL. 269, 269 (2011) (noting that deliberation is limited in scope in China); Wang Xixin & Zhang Yongle, *The Rise of Participatory Governance in China: Empirical Models, Theoretical Framework, and Institutional Analysis*, 13 U. PA. ASIAN L. REV. 24, 37 (2018). In China, the public cannot challenge regulations in court, but they may request a review by the NPC Standing Committee or State Council if a rule appears inconsistent with higher-level laws. Jamie P. Horsley, *China Implements More Participatory Rulemaking Under Communist Party*, REGUL. REV. (Mar. 15, 2018), <https://www.theregreview.org/2018/03/15/horsley-china-implements-participatory-rulemaking/> [<https://perma.cc/L8YN-P45N>].

that are not represented in their proceedings.”²³⁵ As a result, ordinary citizens who are most vulnerable to the side effects of emerging technologies are not fully represented or empowered. Their concerns rarely surface in final regulations, not due to a lack of interest or insight, but because the design of the process leaves out dissenting, noninstitutional voices. As revealed by the Xiaomi accident, it was not regulatory foresight but public outcry after the accident that finally forced safety into the conversation. The need for accountability had always existed, but it went unheard until the damage was done. Participatory governance offers a different path: one where lawmaking does not begin with elite consensus and end with public reaction, but where diverse voices are actively invited to shape the rules that govern their technological lives.

It is also through the lens of marginalized stakeholders that the intricacies and blind spots of the regulatory system come into focus, exposing whether regulators are truly responsive to those they are meant to serve.²³⁶ Marginalized stakeholders contribute fresh perspectives and overlooked knowledge and deepen the discourse on what constitutes regulatory efficiency and resilience.²³⁷ Particularly in the regulation of emerging technologies, “overly technical assessments with no accounting for human experience are not useful.”²³⁸ Broadening public participation is thus not just desirable, but is essential to producing wiser, more equitable decisions grounded in diverse experiences and motivations.²³⁹ However, research suggests that China’s central government ministries remain relatively unresponsive, with significant aspects of policymaking insulated from genuine public input.²⁴⁰ The disconnect is especially troubling in the governance of emerging technologies, where the insights, creativity, and lived experiences of ordinary citizens should be central, but are too often sidelined.²⁴¹

²³⁵ Roger C. Cramton, *The Why, Where, and How of Broadened Public Participation in the Administrative Process*, 60 GEO. L.J. 525, 529 (1972) (arguing that governmental institutions are responsive but are only responsive to the inputs and feedbacks they receive).

²³⁶ See Morag McDerment, *Alternative Imaginings of Regulation: An Experiment in Co-Production*, 45 J. L. & Soc’y 156, 159 (2018).

²³⁷ Lee, *supra* note 228, at 406.

²³⁸ Emanuel Moss et al., *Assembling Accountability: Algorithmic Impact Assessment for the Public Interest*, DATA & SOC’Y 1, 23 (2021).

²³⁹ Cramton, *supra* note 235, at 528–30.

²⁴⁰ See Steven J. Balla et al., Notice the Comment? Chinese Government Responsiveness to Public Participation in the Policymaking Process 24 (Nov. 2022) (unpublished comment) (on file with George Washington Univ.: Regul. Stud. Ctr.).

²⁴¹ See McDerment, *supra* note 236, at 157.

Moreover, marginalized stakeholders include not only ordinary citizens but also tech startups, who often find themselves navigating rough waters of regulatory pressure. They are bound by rules they had no hand in shaping but disciplined and punished for their violations. Although frequently positioned as the intended beneficiaries of China's pro-innovation policies, these startups are seldom granted a meaningful voice in the regulatory process.²⁴² In her interviews with Chinese entrepreneurs in the tech industry, sociology professor Ya-Wen Lei observed that many of them view the state's extensive investment in emerging technologies, as well as its accompanying legal and technical frameworks, as ineffective, or even counterproductive.²⁴³ From the perspectives of these practitioners, these legal instruments fail to address the real-world challenges they face.²⁴⁴ As a result, while innovation is rhetorically championed as a policymaking priority, regulation may inadvertently stifle it by neglecting the actual needs and capacities of those expected to drive it forward.²⁴⁵

The governance of generative AI provides an illustrative example. Despite the incentives offered by the local governments to encourage registration and compliance, the reality for many AI startups is a bureaucratic burden that is both disproportionate and impractical.²⁴⁶ These companies, already operating under tight resources, are often ill-equipped to meet the heavy-handed compliance obligations set by regulators.²⁴⁷ The Basic Requirements, for instance, demand near-flawless content moderation, requiring a 96 percent pass rate for corpus data and 90 percent for generated content.²⁴⁸ In practice, this could mean manually reviewing thousands of data points, a task that is prohibitively expensive and technically infeasible for smaller firms.²⁴⁹ Moreover, while keyword

²⁴² Seth C. Oranburg, *Encouraging Entrepreneurship and Innovation Through Regulatory Democratization*, 57 SAN DIEGO L. REV. 757, 759 (2020) (“[A]lthough well-intentioned lawmakers might try to devise regulatory regimes that support entrepreneurs, the larger incumbents in the market are more able to influence and benefit from the regulatory process”).

²⁴³ See LEI, *supra* note 190, at 152.

²⁴⁴ See *id.*

²⁴⁵ See Anu Bradford, *The False Choice Between Digital Regulation and Innovation*, 119 NW. U. L. REV. 377, 399 (2024) (discussing that regulation stifles startup innovation).

²⁴⁶ See *supra* Part II. B.

²⁴⁷ See Yaokun Qiu, *Regulatory Challenges and System Responses to Generative Artificial Intelligence*, CHINA INSTITUTE FOR SOCIO-LEGAL STUDIES: SHANGHAI JIAO TONG UNIVERSITY (May 6, 2025), <http://www.socio-legal.sjtu.edu.cn/en/wxzy/info.aspx?itemid=4869> (discussing the excessive regulatory burdens imposed on AI service providers) [<https://perma.cc/8YKD-FDLV>].

²⁴⁸ NAT'L TECH. COMM., *supra* note 149, at 13–14.

²⁴⁹ See *id.* at 6.

filters and classification models offer some automation, their reliability depends on continuously updated, well-trained datasets.²⁵⁰ A single flawed keyword list or underperforming classifier could miss actual violations, putting providers at risk of regulatory penalties.²⁵¹ The conclusion could be drawn that the Basic Requirements demand not only technological sophistication but also sustained human oversight, such as manual reviewers, AI trainers, and legal consultants. For startups, this could become an insurmountable barrier to market entry.²⁵²

As a result, the compliance landscape of AI regulation favors well-resourced tech giants, who were, not coincidentally, coauthors of the very rules.²⁵³ China has been criticized for creating AI standards that are not attuned to market realities,²⁵⁴ and the regulatory playing field is skewed. Such an approach risks imposing rigid and misaligned burdens that stifle innovation without effectively addressing real-world harms. The inclusion of small and medium enterprises in the regulatory process can help ensure that emerging standards reflect the diverse capacities, constraints, and practical demands of all stakeholders, rather than the perspectives of dominant firms or bureaucratic actors alone.

It is worth noting that the interests among marginalized stakeholders, such as ordinary citizens and tech startups, can sometimes diverge in the governance of emerging technologies.²⁵⁵ Startups often call for regulatory flexibility to accelerate innovation and scale quickly, while citizens and civil society groups advocate for stronger consumer safeguards, equitable access, and adherence to ethical standards. Their interests do not always align—what is good for a tech startup may be detrimental to broader societal values.²⁵⁶ Nevertheless, precisely because of these tensions, the case for participatory governance becomes more

²⁵⁰ See *id.* at 10.

²⁵¹ *Id.*

²⁵² Abiri & Huang, *supra* note 157, at 15 (noting that some Chinese scholars argue against the overly cautious measures, fearing that AI companies may be forced to take uncontrollable risks).

²⁵³ See generally NAT'L TECH. COMM., *supra* note 149, at 2 (noting big tech companies, such as Huawei and Baidu, as drafters of the *Basic Requirements*).

²⁵⁴ See DING, *supra* note 17, at 200.

²⁵⁵ I thank Professor Bettina Lange for pointing that out.

²⁵⁶ See Elizabeth Pollman & Jordan M. Barry, *Regulatory Entrepreneurship*, 90 S. CAL. L. REV. 383, 443 (2017) (noting that entrepreneurs do not want to get the socially optimal result, they want the result that is best for them). See generally Anupam Chander, *How Law Made Silicon Valley*, 63 EMORY L. J. 639, 666–67 (2015) (noting that the absence of privacy regulations is conducive to startup innovation). Cf. Elizabeth Pollman, *Corporate Disobedience*, 68 DUKE L. J. 709, 731–39 (2019) (discussing the situations where corporate disobedience may be in the greater interest of the public).

compelling. After all, participatory governance doesn't necessarily lead to social consensus.²⁵⁷ It is more about recognizing that all stakeholders, whether citizens or startups, have equal standing in the policymaking process.²⁵⁸ No processes can genuinely claim to be inclusive or democratic if they proceed by ignoring certain voices or treating some as secondary, or worse, disposable.²⁵⁹ What truly matters is that when people are heard, their expectations, worries, and hopes begin to shape the collective imaginary, which, in turn, translates into concrete requirements.²⁶⁰ In a regulatory space defined by conflicting interests and uneven power, the expectation is not to silence dissent or erase conflicts, but to design channels through which those diverse perspectives are acknowledged and meaningfully engaged.

In addition, some critics worry that despite the normative appeal of public participation, the regulation of emerging technologies can be inaccessible to individuals of limited technical and professional expertise.²⁶¹ Another concern is that even if they are involved, their influence could be marginal. As Sherry R. Arnstein sharply criticized over six decades ago in her seminal "A Ladder of Citizen Participation," consulting and informing often mask a deeper exclusion, where citizens are heard but not heeded.

Implementing participatory governance is also easier said than done.²⁶² How to promote meaningful participation of marginalized stakeholders has been a quandary, especially considering the significant investments of time, funding, expertise, and institutional effort to ensure that participation is not only broad but also robust.²⁶³ As a matter of fact, China has embraced the language of collaborative governance and emphasized the importance of multi-stakeholder dialogue in the realm of

²⁵⁷ See Cass R. Sunstein, *Beyond Judicial Minimalism*, 43 TULSA L. REV. 825, 841 (2007) ("Social consensus is hardly a consideration that outweighs everything else"); Joshua Cohen, *Deliberation and Democratic Legitimacy*, in PHILOSOPHY, POLITICS, AND DEMOCRACY: SELECTED PAPERS 16, 25 (2009) ("Even under ideal conditions there is no promise that consensual reasons will be forthcoming.").

²⁵⁸ *Id.*

²⁵⁹ See Matthew Steilen, *Minimalism and Deliberative Democracy: A Closer Look at the Virtues of "Shallowness"*, 33 SEATTLE UNI. L. REV. 391, 414 (2010).

²⁶⁰ Ulnicane et al., *supra* note 123, at 162 (citing Harro Van Lente et al., *Comparing Technological Hype Cycles: Towards a Theory*, 80 TECH. FORECASTING & SOC. CHANGE, 1615, 1616 (2013)).

²⁶¹ See Gilman, *supra* note 42, at 506.

²⁶² See David A. Super, *Laboratories of Destitution: Democratic Experimentalism and The Failure of Antipoverty Law*, 157 UNIV. PA. L. REV. 541, 546–48 (2008) (discussing the shortcomings of participatory governance in the case of antipoverty law).

²⁶³ See *id.* at 547; Lee, *supra* note 228, at 412–13.

AI governance.²⁶⁴ Its AI policies, for example, routinely open with statements endorsing collaborative governance and the inclusion of diverse stakeholders.²⁶⁵ However, these provisions tend to remain aspirational, amounting to manifesto slogans without concrete mechanisms to operationalize the participation of marginalized groups in the actual governance process.²⁶⁶

C. EMPOWERMENT THROUGH TECHNOLOGY

This Part turns to the practical question of how participatory schemes can be embedded into the detailed fabric of AI governance. It suggests that “the answer to the machine is the machine.”²⁶⁷ Technology, the object of regulation, may function as a regulatory tool to enable broader participation of marginalized stakeholders. This Part begins by briefly summarizing the existing literature on regulation through technology, then outlines how digital tools can support participatory governance, and finally evaluates the feasibility of deploying these tools in the context of China’s CAV governance.

Regulation through technology has been a staple of governance discussion ever since the rise of the internet.²⁶⁸ “Code is law,” as Lawrence

²⁶⁴ Christopher Wilson, *Public engagement and AI: A Values Analysis of National Strategies*, 39 GOV’T INFO. QUARTERLY 3 (2022).

²⁶⁵ For example, in China’s Generative AI Measures, the Article 5 provides that: “Support industry associations, enterprises, education and research institutions, public cultural bodies, and relevant professional bodies, etc. to coordinate in areas such as innovation in generative AI technology, the establishment of data resources, applications, and risk prevention.” See CAC, *supra* note 131, art. 5.

²⁶⁶ See Celso Cancela-Outeda, *The EU’s AI Act: A Framework for Collaborative Governance*, 27 INTERNET OF THINGS 1, 2 (2024).

²⁶⁷ See Charles Clark, *The Answer to the Machine is the Machine*, in THE FUTURE OF COPYRIGHT IN A DIGITAL ENVIRONMENT: PROCEEDINGS OF THE ROYAL ACADEMY COLLOQUIUM 139, 139 (P. Bernt Hugenholtz ed., 1996).

²⁶⁸ See LAWRENCE LESSIG, CODE: AND OTHER LAWS OF CYBERSPACE 6 (1999); Bert-Jaap Koops, *Criteria for Normative Technology: The Acceptability of ‘Code as Law’ in Light of Democratic and Constitutional Values*, in REGULATING TECHNOLOGIES: LEGAL FUTURES, REGULATORY FRAMES AND TECHNOLOGICAL FIXES 157 (Roger Brownsword & Karen Yeung eds., 2008); Mulligan & Bamberger, *supra* note 158, at 697; Karen Yeung, *Algorithmic Regulation: A Critical Interrogation*, 12 REGUL. & GOVERNANCE 505, 505–06 (2018). See generally Joel R. Reidenberg, *Lex Informatica: The Formulation of Information Policy Rules Through Technology*, 76 TEX. L. REV. 553 (1998) (explaining the evolution of technological regulations, including default rules for information policy, constitutional rules on the freedom of expression, rights of ownership, as well as network design standards); ROGER BROWNSWORD, LAW 3.0: RULES, REGULATION, AND TECHNOLOGY (2020) (example of the extent of regulation for technology); Zsolt Zódi & Mátyás Bódog, *Is Code Destined to Supersede Law? Behavioural Control by Code and Legal Theory*, 84

Lessig famously put it, captures the idea that technology can function as a powerful regulatory force in its own right through the architecture of control.²⁶⁹ As discussed earlier, technology is believed to be inherently socially constructed, open to interpretation, and constantly reimagined by different groups and institutions.²⁷⁰ That means it can be used to embed values with virtuous intentions.²⁷¹ Indeed, when thoughtfully designed, technology can bring real benefits to regulation: efficiency, precision, scalability, and even greater equity and transparency.²⁷² It also has the potential to open up the regulatory process itself, providing richer feedback loops and new streams of information that can help shape how regulators understand the systems they oversee.²⁷³

The growing body of literature on increasing public participation through emerging technologies shows this promising trend in techno-governance.²⁷⁴ In early 2025, the Organisation for Economic Co-operation and Development released two policy reviews exploring the role of emerging technologies in strengthening citizen engagement.²⁷⁵ These reports present several case studies that demonstrate how AI can facilitate community connections, enhance public knowledge, and improve the

CAMBRIDGE L. J. 175 (2025) (explaining the increased reliance on computer codes and intelligent physical infrastructure as regulation on technology).

²⁶⁹ See LAWRENCE LESSIG, *CODE VERSION 2.0* 36 (2006).

²⁷⁰ See *supra* notes 44–48 and accompanying text.

²⁷¹ See Roger Brownsword, *Code, Control, and Choice: Why East is East and West is West*, 25 *LEGAL STUD.* 1, 11 (2005).

²⁷² *Tackling Civic Participation Challenges with Emerging Technologies: Beyond the Hype*, OECD 20 (2025), https://www.oecd.org/en/publications/2025/04/tackling-civic-participation-challenges-with-emerging-technologies_bbe2a7f5.html [<https://perma.cc/TUGZ-KKEE>] (listing the benefits around scope, interaction, efficiency, and impact); see PRIMAVERA DE FILIPPI & AARON WRIGHT, *BLOCKCHAIN AND THE LAW: THE RULE OF CODE* 196–99 (2018) (discussing the benefits of regulation through blockchain including accuracy, transparency, and certainty); Reidenberg, *supra* note 268, at 577–81 (listing the advantages of Lex Informatica such as automated monitoring and better enforcement); Barbara Lazarotto, *The Role of Technology in Citizens' Right to Good Administration: Examining the Impact of Smart Governments*, in *PUBLIC GOVERNANCE AND EMERGING TECHNOLOGIES: VALUES, TRUST, AND REGULATORY COMPLIANCE* 51, 57 (Jurgen Goossens et al. eds., 2025) (noting that technologies may improve efficiency and transparency).

²⁷³ See Cramton, *supra* note 235, at 528–30.

²⁷⁴ See Zödi & Bódig, *supra* note 268, at 177, 195–96. See generally Bokyoung Shin et al., *A Systematic Analysis of Digital Tools for Citizen Participation*, 41 *GOV'T INFO. Q.* at 1, 6 (2024) (one example of growing literature on the promise of increased public participation).

²⁷⁵ See generally OECD, *How Innovation Ecosystems Foster Citizen Participation Using Emerging Technologies in Portugal, Spain and the Netherlands* (2025), https://www.oecd.org/en/publications/2025/01/how-innovation-ecosystems-foster-citizen-participation-using-emerging-technologies-in-portugal-spain-and-the-netherlands_4d5bfa56.html [<https://perma.cc/R8VH-KDGD>] (exploring the effective use of emerging technologies in becoming more transparent, inclusive, and increase participation); OECD, *supra* note 272 (examines the emerging role digital technologies can play in improving citizen participation).

organization and analysis of online consultations.²⁷⁶ Similarly, the World Bank Group has curated the Digital Citizen Engagement catalog, a comprehensive resource mapping the evolving landscape of digital tools that facilitate citizen input.²⁷⁷ Meanwhile, on the academic front, regulation scholars have undertaken both empirical and normative inquiries into how emerging technologies, including AI and blockchain, can support inclusive governance.²⁷⁸ In the context of emerging technologies regulation, these digital tools, when designed with care, can empower marginalized stakeholders and enhance participatory governance in at least the following four key aspects.

Reduce barriers to participation. Digital platforms and emerging technologies are opening new pathways for participatory governance by lowering the logistical, geographic, and institutional hurdles that have traditionally limited citizen involvement. Online tools, such as forums, surveys, and interactive maps, enable individuals to contribute remotely to policymaking processes, offering feedback, submitting proposals, or engaging in public consultations across various issues.²⁷⁹ One example is OpenStad, an open-source platform from the Netherlands that fosters public engagement through online voting and online consultations.²⁸⁰ AI technologies further enhance this capacity by better conveying citizens' concerns and expectations regarding a specific technological application. A detailed illustration is Pol.is, an AI-powered open-source software designed to capture and analyze what large groups of people think in their own words.²⁸¹ Participants contribute to discussions by submitting short statements in response to prompts. These statements are then randomly shown to others, who react with "agree," "disagree," or "pass," rendering the consultation process more accessible to citizens.²⁸² In addition, blockchain technology has demonstrated great potential in making

²⁷⁶ OECD, *supra* note 272, at 22–26.

²⁷⁷ See generally *Digital CE Stocktake*, WORLD BANK GROUP, <https://airtable.com/appIZOsBU8qIYagOC/shrbZbqkXwY5iugck/tblV7Vz4ebMMCjVik/viwj9Yd5UpqZAt2a1> (last visited Mar. 9, 2026) (organizing various kinds of digital tools used for stakeholder engagement in different nations) [<https://perma.cc/2TRV-H6YF>].

²⁷⁸ See generally Lazarotto, *supra* note 272 (systematic analysis of digital tools in the context of e-participation); Shin et al., *supra* note 274 (example of an empirical study related to how emerging technologies can support inclusive governance); Rikki Dean, *Participatory Governance in the Digital Age: From Input to Oversight*, 17 INT'L J. COMM'N 3562 (2023) (example of a normative study related to how emerging technologies can support inclusive governance).

²⁷⁹ Jain, *supra* note 224.

²⁸⁰ OECD, *supra* note 272, at 22.

²⁸¹ *Id.* at 23.

²⁸² *Id.*

participation more inclusive and trustworthy. It can verify and secure individual input, ensure transparency, and even redistribute decision-making power to traditionally underrepresented groups.²⁸³ For example, Bronwen Morgan's study of the Regen Foundation, a nonprofit trust supporting community-led governance, reveals how blockchain tools can help marginalized communities participate more meaningfully by combining civic voice with tangible economic incentives.²⁸⁴

Empower Government. As highlighted in the Organisation for Economic Co-operation and Development's policy paper, governments are not mere rule-makers but conveners, funders, direct users, and codevelopers in the landscape of technology governance.²⁸⁵ When stakeholders, such as consumers and startups, hold divergent and even conflicting interests, governments have a critical role to play in balancing these tensions.²⁸⁶ AI can be a valuable tool in this process by supporting consensus building across large and diverse populations. One fascinating example is Habermas Machine, a large language model developed by UK researchers, designed to assist in generating more agreeable and inclusive statements.²⁸⁷ Rather than disregarding dissenting viewpoints, the tool attempts to incorporate minority perspectives into more widely accepted formulations, demonstrating how AI can help facilitate consensus without erasing differences.²⁸⁸

Capacity Building of Citizens. Considering the complexity and obscurity of emerging technologies, empowering citizens to participate in governance requires more than just opening channels for input—it requires equipping them with the tools to understand what is at stake and how a specific technology will influence their daily lives. Emerging technologies such as augmented reality and generative AI offer promising avenues to make technical knowledge more accessible to common users. For example, augmented reality can enable immersive, interactive learning environments that demystify abstract concepts and visualize the real-world impact of specific technologies.²⁸⁹ A recent European Commission report underscores this potential, finding that augmented reality improves

²⁸³ See Bronwen Morgan, *Institutional Design in Commons-Based Sharing Economies: Platform, Care and Place*, 20 INT'L J. L. IN CONTEXT 496, 504–05 (2024).

²⁸⁴ *Id.*

²⁸⁵ OECD, *supra* note 272, at 33.

²⁸⁶ See *supra* notes 253–57 and accompanying text.

²⁸⁷ OECD, *supra* note 272, at 22.

²⁸⁸ See *id.*

²⁸⁹ *Id.* at 29.

educational outcomes by providing creative exercises and allowing more intuitive forms of communication.²⁹⁰ In participatory settings, this can help citizens better articulate their views and contribute more substantively to discussions on complex regulatory issues. Another example of making complex technological questions accessible to everyone is Panoramic AI, an online platform powered by generative AI. It distills dense, technical materials into plain language summaries while preserving links to original sources, facilitating fact-checking and minimizing the risk of oversimplification.²⁹¹

Increase Transparency. Civic tech platforms can also improve transparency around the policymaking process, especially for marginalized groups. For example, the aforementioned Pol.is not only allows citizens to shape the agenda of public conversations, but also visualizes inputs in real time using algorithmic analysis.²⁹² The system clusters opinions and highlights points of consensus and contention in a transparent, user-friendly format, offering a concrete way to counter the capture problem that often plagues technology regulation.²⁹³ Another notable practice is participatory budgeting, which has enhanced political legitimacy since the 1990s by making the allocation of public funds open and deliberative.²⁹⁴ Participatory budgeting has been more common in local governance, wherein residents can directly decide how to allocate a portion of the public budget. With digitalization, this model can expand its reach, offering great opportunities for different stakeholders to partake in large-scale political decision-making.²⁹⁵ Online platforms now allow broader stakeholder involvement in high-stakes fiscal decisions, making the process more inclusive, scalable, and tractable.²⁹⁶ In the context of emerging technologies regulation, it has the potential to address issues of political patronage and social exclusion.²⁹⁷

Given its long-standing techno-solutionist orientation, regulation through technology has found strong endorsement in China. In recent

²⁹⁰ HUPONT TORRES ET AL., NEXT GENERATION VIRTUAL WORLDS: SOCIETAL, TECHNOLOGICAL, ECONOMIC AND POLICY CHALLENGES FOR THE EU 27 (2023).

²⁹¹ OECD, *supra* note 272, at 25.

²⁹² OECD, *supra* note 272, at 23; Dirk Helbing et al., *Democracy by Design: Perspectives for Digitally Assisted, Participatory Upgrades of Society*, 71 J. COMPUT. SCI. 1, 6–7 (2023).

²⁹³ Helbing et al., *supra* note 292, at 6–7.

²⁹⁴ *Id.* at 7; see FUNG & WRIGHT, *supra* note 228, at 10–12.

²⁹⁵ See Lee, *supra* note 228, at 411 & n. 35; Dean, *supra* note 278, at 3569–70.

²⁹⁶ Helbing et al., *supra* note 292, at 7 (noting that online platforms make participatory budgeting cheaper and more tractable).

²⁹⁷ See *id.* at 8.

years, the Chinese government has advanced its e-governance agenda to better connect to citizens and streamline administrative procedures.²⁹⁸ Considering the state's sheer population size and its hierarchical structure, this push has prioritized administrative efficiency over genuine public participation.²⁹⁹ Nevertheless, participatory governance has roots in China, with local governments experimenting with e-participation tools in their municipal decision-making.³⁰⁰ Moreover, in real-world settings, public outcry about high-profile accidents or scandals can trigger responses in technology policies.³⁰¹ For example, after the Xiaomi accident, Chinese regulators imposed strict rules on vehicle advertisements by prohibiting terms like "self-driving" or "smart driving."³⁰² However, institutionalized avenues for public engagement remain so limited that voices from minority stakeholders often need to accumulate through complaints or reach critical mass via media before they are taken seriously by authorities.³⁰³

Digital civic technologies, discussed above, may help lower participation barriers and amplify marginalized voices in this context. During the regulation of CAVs, public inputs can be formally embedded into ex ante regulatory processes, such as premarket approvals, pilot authorizations, and safety assessments for CAV deployment. For example, regulators could require that the outcomes from structured public consultations (e.g., summarized and clustered through AI tools like Pol.is) be submitted as part of mandatory regulatory impact assessment or safety case filings.³⁰⁴ In this way, public concerns regarding pedestrian safety, data surveillance, or system reliability would not merely inform regulators informally but become part of the administrative record, shaping both the scope and conditions of regulatory approval. Such procedural integration

²⁹⁸ Ge Xin & Jie Huang, *Making the People's Voice Heard: Pathways of E-Participative Governance in China*, 10 J. CHINESE GOVERNANCE 33, 33–34 (2025).

²⁹⁹ See Xixin & Yongle, *supra* note 234, at 24; Yuan Wang & Rongbin Han, *Cosmetic Responsiveness: Why and How Local Authorities Respond to Mundane Online Complaints in China*, 28 J. CHINESE POL. SCI. 187, 187 (2023).

³⁰⁰ Xin & Huang, *supra* note 298, at 34.

³⁰¹ See *supra* Part III.A.; see Xixin & Yongle, *supra* note 234, at 49 (providing examples of the rise of the participatory model in China); Sheehan, *supra* note 18, at 6–7.

³⁰² *China Bans 'Smart' and 'Autonomous' Driving Terms From Vehicle Ads*, BUSINESS TIMES (Apr. 18, 2025), <https://www.businesstimes.com.sg/companies-markets/transport-logistics/china-bans-smart-and-autonomous-driving-terms-vehicle-ads?close=true> [<https://perma.cc/VKJ3-DEP8>].

³⁰³ See Xixin & Yongle, *supra* note 234, at 26; see Howard H. Wang et al., *How Institutionalized Feedback Works: Online Citizen Complaints and Local Government Responsiveness in China*, 38 GOVERNANCE 1, 3 (2025).

³⁰⁴ See *supra* notes 279–81 and accompanying text.

could help transform participation from symbolic engagement into legally salient input.

Participatory technologies can also support iterative and adaptive regulation, which is particularly suited to AI governance given the technology's evolving risk profile. For instance, when designing policies for CAVs, regulators can use AI-enabled platforms, like Habermas Machine, to continuously gather and analyze feedback from road users, local communities, and professional drivers during pilot programs and phased rollouts.³⁰⁵ These inputs can surface the concerns held by minority stakeholders and improve regulatory recalibration, such as tightening operational design domains, adjusting human oversight requirements, or revising CAV promotion rules. In this respect, participatory tools complement the existing governance models by supplying real-time, structured feedback that would otherwise be costly or administratively infeasible to collect at scale. Moreover, the use of standardized, auditable participatory tools reduces the discretion regulators might otherwise exercise in selectively invoking "expert judgment" to justify industry-favorable outcomes.³⁰⁶

In addition, digital civic technologies can enhance capacity building, which is especially critical in the AI governance context, where the technical complexity of autonomous systems can alienate lay participants. Tools such as generative-AI-powered explainers, immersive virtual reality simulations of automated driving scenarios, and plain-language risk visualization can help bridge the epistemic gap between experts and the public.³⁰⁷ For example, immersive simulation could allow citizens to experience how a CAV navigates mixed traffic environments or responds to system failures, enabling more informed input on acceptable risk thresholds and regulatory trade-offs. When paired with participatory platforms, such tools can enhance both the quantity and quality of public engagement.

That said, these participatory technologies are not a panacea. Their effectiveness depends on accompanying institutional commitments, such as procedural duties to respond to public input, requirements to provide reasoned explanations when public concerns are overridden, and safeguards against performative consultation. When appropriately deployed, they can enable more inclusive, informed, and responsive

³⁰⁵ See *supra* notes 287–88 and accompanying text.

³⁰⁶ See *supra* notes 252–53 and accompanying text.

³⁰⁷ See *supra* notes 289–91 and accompanying text.

governance of emerging technologies. Again, as AI governance expert Matt Sheehan once remarked, while regulators around the world may differ on the substance of AI regulation, the underlying regulatory infrastructure, such as the use of digital tools discussed here, can offer valuable lessons for other countries that seek to expand public participation and empower marginalized stakeholders in the deliberative process.³⁰⁸

IV. CONCLUSION

This article conceptualizes techno-pragmatic governance as a defining characteristic of China's regulatory evolution. It provides a historical-comparative account of China's regulatory responses to three key technological waves—the internet, blockchain, and AI. Through the lens of the STS, this article brings attention to the role of sociotechnical imaginaries in shaping China's technology regulation. It shows how dominant visions—crafted jointly by state actors and technology firms—advance narratives of control, efficiency, and national progress while sidelining alternative imaginaries grounded in concerns for equity, justice, and safety. It offers an approach of normative and practical intervention by proposing the development and integration of e-participatory tools into the detailed fabric of AI governance. By embedding participation more deeply and meaningfully into governance processes, these tools promise to enhance accountability, broaden public trust, and make AI regulation more adaptive, inclusive, and democratically legitimate. It is noteworthy that the scope of this Article is confined to domestic regulatory dynamics and does not address how global cooperation and international law shape China's regulatory trajectory—an important dimension that future research will explore.

³⁰⁸ See Sheehan, *supra* note 17, at 3.