

Systems Intelligence for Sustainability Industry: Reflection and Perspective

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Brief—This editorial reflects on the evolution and future direction of systems intelligence for sustainability industry (SI4SI), an initiative that has grown from a workshop at the 2017 UNDP conference into a continuing international dialogue connecting systems science, artificial intelligence (AI), and sustainable development. As AI technologies rapidly democratize knowledge and capability, they simultaneously introduce systemic risks, where termination-triggering knowledge, intelligence, and actions may amplify unintended consequences at unprecedented scales. Such risks call for governance that aligns intelligence with long-term societal well-being. Inspired by a modern interpretation of Pascal's wager, we argue that precaution and responsibility must precede large-scale deployment of advanced AI. An embedded governance paradigm integrating blockchain intelligence and decentralized autonomous organizations is proposed to enhance transparency, accountability, and collective coordination. Essentially, SI4SI advocates a shift from artificial intelligence for efficiency to prescriptive intelligence for sustainability, emphasizing that technological progress must be prescribed and controlled by human values and welfare.

Index Terms—Systems intelligence, sustainability industry, artificial intelligence governance, blockchain intelligence

I. REFLECTION

A decade has passed since the concept of systems intelligence for sustainability industry (SI4SI) was first proposed as a small workshop at Conference of Consultation on UNDP Asia-Pacific Regional Programme (2018–2021), Bangkok, 23–24 August 2017, and I was invited to present a keynote on “New IT and Coming New Axial Age: The Mission and Future of History” (see Figs. 1 and 2). At Bangkok, I made a few promotional videos for UNDP's SDG, Sustainable Development Goals, and arranged an MOU between QAI and UNDP mainly for cooperation in developing SDG related AI and SI4SI (see Figs. 3 and 4). Now, SI4SI has gradually evolved into a series of international dialogues that connect systems science, artificial intelligence, and sustainable development for human service and well-being, from Bangkok (2017), Munich (2018), Bari (2019), Macau (2020), Hang Kong (2021), Singapore (2023), Hawaii (2023), Kuala Lumpur (2025), and Beijing (2024 and 2026) (see Fig. 5). I would like to take this opportunity to thank Mr. Haoliang Xu, UN's Under-Secretary-General for initiating and supporting SI4SI activities (Xu at SI4SI, see Fig. 6).

At that moment, a simple but important realization emerged: sustainability challenges are not isolated technical problems. They are deeply intertwined with complicated natural and social problems, shaped by feedback, coupling, and long-term

natural-social-technical diversified and uncertainty processes. Addressing them requires not only better tools, but also deeper intelligence about the complex ecological systems themselves.

United Nations Development Programme
Bangkok Regional Hub



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14 August 2017

Dear Mr. Wang,

Invitation: Consultation on UNDP Asia-Pacific Regional Programme (2018–2021)
23–24 August 2017 at Amari Watgate hotel, Bangkok, Thailand

We are delighted to invite you to be our Key note speaker in the topic of “Artificial Intelligence and Coming New Axial Age: The Mission and Future of History” in the upcoming “Consultation on UNDP Asia-Pacific Regional Programme (2018–2021)” taking place in Bangkok, Thailand on 23–24 August 2017.

This meeting is taking place at an important time, when Asia-Pacific is at a tipping point. While sustained economic growth has lifted over a billion people out of poverty since 1990, it has left a visible impact on the environment. The devastating effects of environmental degradation and climate change, which disproportionately affect the poor and marginalized, are also diminishing the prospects for future growth. While growth prospects are positive, the region risks becoming locked-in to unsustainable and exclusionary pathways. The next years will be critical for ensuring the balance tips the other way—toward securing sustainable and inclusive pathways to development that accelerate achievement of the Sustainable Development Goals.

Fig. 1 New AI for sustainability at UNDP Asia-Pacific Regional Programme Consultation (2018–2021): Invitation Letter.



Fig. 2 New IT and the Third Axial Age at UNDP.

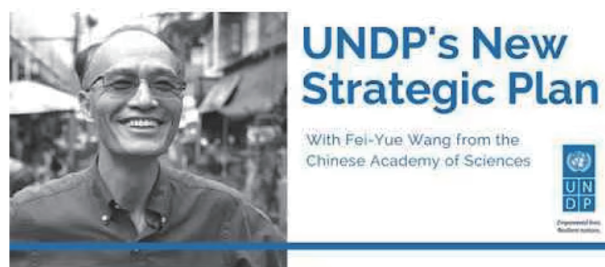


Fig. 3 A video at YouTube for UNDP's new strategic plan.

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**MEMORANDUM OF UNDERSTANDING
BETWEEN
THE UNITED NATIONS DEVELOPMENT PROGRAMME
AND
QINGDAO ACADEMY OF INTELLIGENT INDUSTRIES**

This Memorandum of Understanding ("MOU") is entered into by the United Nations Development Programme ("UNDP"), a subsidiary organ of the United Nations, an intergovernmental organization established by its Member States with its headquarters in New York, NY (USA), and the Qingdao Academy of Intelligent Industries (hereinafter "QAI"), headquartered in Qingdao, China. UNDP and QAI are hereinafter referred to individually as a "Party" and jointly as the "Parties";

Fig. 4 MOU between UNDP and the QAI.

II. PERSPECTIVE

We are living through a historical shift in the distribution of knowledge and capability. For centuries, expertise and advanced technologies were scarce resources, concentrated in a few institutions. Today, artificial intelligence is rapidly transforming knowledge into a public and massive utility. Capabilities that once required years of training or large organizations can now be automated, replicated, and deployed at scale.

This democratization of intelligence is powerful, but it is not neutral. Alongside the benefits, it introduces systemic risks that deserve careful attention. We describe these risks through four cascading notions: termination triggering knowledge (TTK), termination triggering intelligence (TTI), termination triggering action (TTA), and termination triggering event (TTE).

As knowledge and intelligence become widely accessible, the barriers to high-impact actions are lowered. In extreme cases, individuals or small groups may acquire capabilities once comparable to those of large institutions or even states. The combination of automation, optimization, and autonomous decision-making compresses the distance between intention and execution.

The concern is therefore not hypothetical. When intelligence scales without governance, small errors may propagate into systemic and fatal failures [1]. Artificial intelligence does not only amplify productivity; it also amplifies consequences. Hence, the central issue is no longer whether AI should advance. Its progress is inevitable, but whether its growth is

accompanied by responsibility, accountability, and restraint. Without governance, intelligence may accelerate termination. With governance, intelligence may enhance sustainability. This tension is precisely why SI4SI is needed.

The rise of increasingly capable AI systems confronts humanity with a modern version of Pascal's wager. If we underestimate the risks of advanced intelligence and they materialize, the consequences may be irreversible. If we overestimate the risks and invest early in governance and safeguards, the cost is comparatively limited. Under deep uncertainty with potentially catastrophic outcomes, prudence becomes the rational choice. This "Pascal's New Wager" suggests a simple but profound principle: AI may not be interpretable, but AI must be governable. Safety, security, and sustainability must precede large-scale deployment. AI governance should not be perceived as an obstacle to innovation. Rather, it is the very condition that allows innovation to remain sustainable and socially acceptable. Intelligence without responsibility is fragile; intelligence with responsibility becomes resilient. In this sense, systems intelligence is not only about making systems smarter, but about making them wiser.

As intelligent systems become integral to industrial and societal infrastructures, governance itself must evolve. Traditional regulation relies largely on centralized oversight and after-the-fact supervision. However, distributed/decentralized and autonomous/autentic systems operate at speeds and scales that exceed these approaches. Governance that remains external to the system is often reactive and insufficient. What is needed is governance embedded by design and secured with implementation and application.

Blockchain intelligence (BI) offers a trusted computational foundation at this point [2, 3]. By enabling tamper-resistant records, verifiable data provenance, and accountable decision-making processes, BI transforms opaque AI operations into auditable ones. Training data, model updates, and operational behaviors can be traced and validated, strengthening transparency and reducing the risks associated with termination-triggering knowledge and intelligence. Decentralized autonomous/autentic organizations (DAOs) extend this foundation to collective action. By encoding rules, incentives, and



Fig. 5 Evolution of the SI4SI international dialogue series (2017–2026).



Fig. 6 SI4SI workshop at Beijing, 2024.

consensus mechanisms into programmable protocols, DAO structures enable stakeholders to participate in governance in a structured and enforceable manner. Decisions become rule-based rather than authority-based, reducing single points of failure and encouraging shared responsibility. BI provides transparency and trust, while DAO provides coordination and enforceability [4]. Their integration represents a shift from governance as supervision to governance as infrastructure. Sustainability is thus embedded into the system itself rather than appended as an afterthought. This integration forms an essential pathway toward systems intelligence that is not only powerful, but also truly and sustainably true: trustworthy, reliable, useful, and effective/efficient.

Looking back over the past years, SI4SI has grown from a small workshop into a continuing global conversation. Yet the challenges ahead remain profound. Intelligence alone does not guarantee progress. Optimization alone does not ensure justice. Automation alone does not create sustainability. What we truly require is systems thinking of systems intelligence, and further, ecological thinking of ecological intelligence, supported by the current wave of embodied intelligence, so that we may better understand interdependence, anticipate long-term consequences, and align technological advancement with human values.

In the years to come, the central task will not simply be to make AI systems more capable, faster, or more widely deployable. The more essential task will be to make them

more governable, more accountable, and more responsive to the needs of humanity as a whole. This means that future intelligent systems should be designed not only for performance, but also for responsibility; not only for efficiency, but also for resilience; not only for autonomy, but also for coordination with social, ethical, and ecological constraints. In this sense, the next stage of AI development must move beyond the narrow pursuit of functional superiority toward a broader commitment to sustainable and trustworthy intelligence.

Such a transition will require collaboration across disciplines, institutions, and nations. Scientists, engineers, policy-makers, industries, and international organizations must work together to build governance mechanisms, technical infrastructures, and shared norms that can guide intelligent systems toward beneficial outcomes. Education, standards, policy experimentation, and public participation will all be indispensable in this process. Blockchain intelligence and decentralized organizational mechanisms may provide important foundations, but even more fundamentally, we need a common recognition that the future of intelligence is inseparable from the future of human civilization and the planet that sustains it.

The future of AI will shape not only industries, but the trajectory of civilization itself. Our responsibility, therefore, is clear: intelligence must be prescribed, governed, and grounded in sustainability, so that SI4SI may continue to serve as both a platform for international dialogue and a practical framework for action. Ultimately, systems intelligence for sustainability industry is not only about smarter systems for industry, but about wiser systems for the future of humanity.

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