nukmnhau

Sustainable AI : Dreams of Neutrality

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Chunk 1

II. p. 4, Chunk 3: Vorwort
I. p. 173, Chunk 2: Vorwort KI & Gestaltung
III. p. 40, Chunk 28: Building AI Intuition – Four…

From futuristic visuals of robotic arms cradling butterflies to data dashboards controlling ecosystems, the visual and linguistic landscape surrounding the concept of "sustainable AI" profoundly shapes how we conceptualize AI systems and sustainability. Yet, these depictions might be leading us astray.

Chunk 2

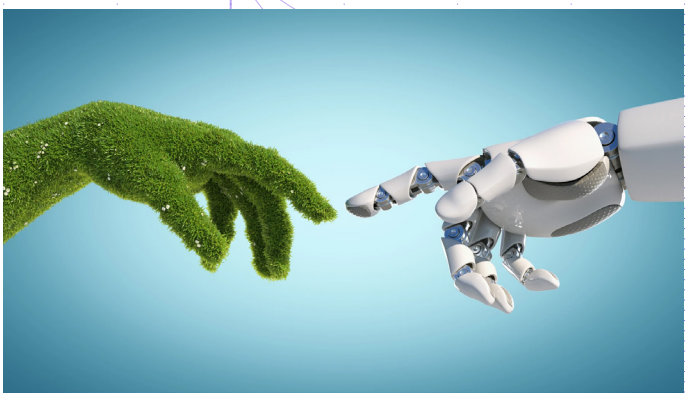

Figure 1: A reimagining of Leonardo da Vinci's *The Creation of Adam*.

II. p. 263, Chunk 12: TRANSFORM 23
III. p. 74, Chunk 3: Introduction to Critical AI…
II. p. 139, Chunk 1: Editorial: Physical AI

The hype surrounding sustainable AI

The concept of “sustainable AI” has rapidly gained traction, engaging academics, policymakers, and developers [1].

Chunk 4 Often referred to in policy discussions as “twinning” or the “twin transition” [2], sustainable AI is advocated and increasingly seen as imperative in addressing the imminent and existential environmental crises [3] [4] [5].

Aimee van Wynsberghe [6] was among the first to distinguish between “sustainability of AI,” which examines AI’s environmental impact, and “sustainable AI,” which explores AI’s applications in solving ecological challenges. She argues that sustainable AI must move beyond technical implementation to address systemic concerns [7]. Yet, critical issues such as resource costs, rebound effects, and feasibility within current economic systems remain underexplored [8] [9].

Chunk 5 Examples like IBM’s Green Horizon project and DeepMind’s GenCast highlight this duality. While Green Horizon uses AI to optimize renewable energy and predict pollution, and GenCast forecasts extreme weather events, such initiatives come with significant costs. Google, for instance, has reported a 50% increase in emissions over five years due to the energy demands of large AI models despite their pledge to become carbon neutral by 2030 [10].

While there has been considerable hype and attention surrounding both concepts “AI” and “Sustainability”, already defining and identifying socio-technical systems as either ‘AI’, ’green’ or ‘sustainable’ remains a contentious subject of debate.

1: European Commission. Joint Research Centre., 2022. Towards a green & digital future: key requirements for successful twin transitions in the European Union. LU: Publications Office.

2: Kovacic, Z., García Casa as, C., Argüelles, L., Yá ez Serrano, P., Ribera-Fumaz, R., Prause, L., and March, H., 2024. The twin green and digital transition: High-level policy or science fiction? Environment and Planning E: Nature and Space, 25148486241258046.

3: Brevini, B., 2020. Black boxes, not green: Mythologizing artificial intelligence and omitting the environment. Big Data & Society, 7 (2), 205395172093514.

4: Coeckelbergh, M., 2021. AI for climate: freedom, justice, and other ethical and political challenges. AI and Ethics, 1 (1), 67–72.

5: Markey, E., Heinrich, M., Eshoo, A., & Beyer, D., 2024. Markey, Heinrich, Eshoo, Beyer Introduce Legislation to Investigate, Measure Environmental Impacts of Artificial Intelligence. [online] Available at: https://www.markey.senate.gov/news/press-releases/markey-heinrich-eshoo-beyer-introduce-legislation-to-investigate-measure-environmental-impacts-of-artificial-intelligence [Accessed 26 Nov. 2024].

6: Van Wynsberghe, A. (2021). Sustainable AI: AI for sustainability and the sustainability of AI. AI and Ethics, 1(3), 213–218. Available at: https://doi.org/10.1007/s43681-021-00043-6

7: Van Wynsberghe, A. (2021). Sustainable AI: AI for sustainability and the sustainability of AI. AI and Ethics, 1(3), 213–218. Available at: https://doi.org/10.1007/s43681-021-00043-6

8: Crawford, K. (2021) Atlas of AI. New Haven, United States: Yale University Press, pp. 4-48.

9: Jobin, A., Ienca, M., and Vayena, E. (2019) 'The global landscape of AI ethics guidelines', Nature Machine Intelligence, 1(9), Article 9. Available at: https://doi.org/10.1038/s42256-019-0088-2

10: Google, 2024. Google Environmental Report. https://sustainability.google/reports/google-2024-environmental-report/

Chunk 6

This is not only due to differing economic and political interests and a lack of transparency [11] but also because of the vast semantic space and narratives evoked, shaping our understanding of "sustainable AI". This semantic ambiguity becomes evident when one examines online discussions on "sustainable AI," where established visual and textual metaphors dominate. These framings shape our understanding of technology's role in ecological solutions and reveal the assumptions that guide our actions in the face of intertwined technological and environmental challenges.

II. p. 124, Chunk 15: You Press the Button, They…
II. p. 4, Chunk 3: Vorwort
III. p. 177, Chunk 12: Introduction

New technologies, old Ideas

Despite the much-touted technological advances of AI [12] and its growing application in sustainability initiatives [13], its framing—both visual and linguistic—draws heavily on familiar narrative constructs. Multimodal metaphors rooted in source domains such as salvation, mechanics, warfare, datafication, and economics continue to permeate discourse [14].

Figure 2: multimodal Metaphor *"AI is a Saviour of Vulnerable Planet"*

Sustainable AI is frequently framed as the "savior" of our endangered planet, a narrative vividly embodied in reimaginings of *The Creation of Adam* where a robot hand reaches out to a tree hand (see figure 1). This imagery draws on the iconic symbolism of divine creation, reframing AI as a godlike force bridging technology and nature. Other common portrayals cast AI as a "weapon" in the fight against climate change or as a powerful "tool" to repair the damaged planet.

While "sustainable AI" is celebrated as a novel technology capable of bringing transformational change and potentially solving the sustainability crisis [15], its linguistic and visual portrayals, though suggesting innovation, heavily borrow from past constructs. These depictions reinforce a technocentric perspective, emphasizing control and mastery over ecological systems that have long shaped our interactions with the natural world.

Chunk 7

One prominent multimodal metaphor—"Earth as a digital (eco)system"—deserves closer scrutiny. The following section will examine in greater detail how this multimodal metaphor influences our understanding of the environment and its implications for our conceptualization of AI and sustainability.

11: Kaack, L. H., Donti, P. L., Strubell, E., Kamiya, G., Creutzig, F., & Rolnick, D. (2022). Aligning artificial intelligence with climate change mitigation. Nature Climate Change, 12(6), Article 6. https://doi.org/10.1038/s41558-022-01377-7

12: Brevini, B., 2020. Black boxes, not green: Mythologizing artificial intelligence and omitting the environment. Big Data & Society, 7 (2), 205395172093514.

13: Cowls, J., Tsamados, A., Taddeo, M., and Floridi, L. (2023) 'The AI gambit: Leveraging artificial intelligence to combat climate change–opportunities, challenges, and recommendations', AI and SOCIETY, 38(1), pp. 283–307. Available at: https://doi.org/10.1007/s00146-021-01294-x.

14: Wallenborn, J. T., & Roßmann, M. (2024, August 30). The Metaphorical Landscape of Sustainable AI: Exploring Technology Futures on Twitter. https://doi.org/10.31219/osf.io/3sbc7

15: Cowls, J., Tsamados, A., Taddeo, M., and Floridi, L. (2023) 'The AI gambit: Leveraging artificial intelligence to combat climate change–opportunities, challenges, and recommendations', AI and SOCIETY, 38(1), pp. 283–307. Available at: https://doi.org/10.1007/s00146-021-01294-x.

16: Wallenborn, J. T., & Roßmann, M. (2024, August 30). The Metaphorical Landscape of Sustainable AI: Exploring Technology Futures on Twitter. https://doi.org/10.31219/osf.io/3sbc7

System Earth and the pursuit of control

The metaphor of Earth or Nature as a "digital ecosystem" is a prevalent in contemporary online discourses surrounding sustainable AI [16]. Visual representations frequently render Earth in soothing greens and blues, depicting it as a network of glowing data points, a grid of microchips intertwined with organic growth, or a seamless integration of machine learning and environmental systems (see Figure 3).

Chunk 8 These portrayals construct a future vision of a world that is observable, manageable, and ultimately controllable through technology.

III. p. 85, Chunk 7: Earth's Basilisk

Figure 3: Planet Earth is a digital Ecosystem

Chunk 9 The idea of Earth as a system has long captivated imaginations, shaping both our understanding of nature and our aspirations to control it. Buckminster Fuller's "Spaceship Earth" (1969) famously depicted Earth as a finite, closed system requiring meticulous human management [17] – a metaphor that casts humans as engineers of an interstellar vehicle [18]. Similarly, the very term "ecosystem", rooted in systems theory, encapsulates a mechanistic worldview and instrumental view of nature, that assumes natural relationships can be operationalized and optimized [19] [20].

III. p. 85, Chunk 7: Earth's Basilisk
I. p. 193, Chunk 4: Unpacking the Language of…

Chunk 10 These frameworks invite us to view Earth not as a living, breathing world but as a machine, reinforcing the Cartesian vision of humans as separate from and superior to the nature world.[21] [22]

Historically, such metaphors have facilitated an anthropocentric perspective that values predictability, control, and optimization. Such metaphors risk reducing the complexity and vitality of nature to a mere apparatus, supporting a cybernetic worldview that privileges abstract models over sensory, lived relationships with the environment. In contrast, *Gaia theory* [23] challenges these mechanistic principles by emphasizing Earth's emergent, self-regulating dynamics.

17: Princen, T. (2010). Speaking of sustainability: The potential of metaphor. Sustainability: Science, Practice, and Policy, 6(2), 60–65. Available at: https://doi.org/10.1080/15487733.2010.11908050

18: Muir, S.A. (1994) 'THE WEB AND THE SPACESHIP: Metaphors of the Environment', ETC: A Review of General Semantics, 51(2), pp. 145-152.

19: Brain, T. (2018) 'The Environment Is Not A System', A Peer-Reviewed Journal About, 7(1), pp. 152- 165. DOI: 10.7146/aprja.v7i1.116062.

20: Larson, B. (2011) Metaphors for Environmental Sustainability: Redefining Our Relationship with Nature. Yale University Press.

21: Muir, S.A. (1994) 'THE WEB AND THE SPACESHIP: Metaphors of the Environment', ETC: A Review of General Semantics, 51(2), pp. 145-152.

22: Rout, M., and Reid, J. (2020). Embracing indigenous metaphors: A new/old way of thinking about sustainability. Sustainability Science, 15(3), 945–954. Available at: https://doi.org/10.1007/s11625-020-00783-0

23: Lovelock, J.E. & Margulis, L., 1974. Atmospheric homeostasis by and for the biosphere: the Gaia hypothesis. Tellus A, 26(1–2), pp.2–10. Available at: https://doi.org/10.3402/tellusa.v26i1-2.9731.

Chunk 11

It proposes that Earth operates as a self-regulating systems in which living organisms and their inorganic surroundings interact to maintain conditions suitable for life. Gaia highlights the unpredictability and interdependence of all life forms, grounded in principles of interconnectedness and autopoeisis.[24]

Mechanistic metaphors, rooted in 17th-century science, liken the natural world to a collection of functional parts, justifying human intervention and manipulation.

Chunk 12

This tradition fosters the belief that researchers and engineers hold a quasi-divine mandate to examine and adapt nature as needed.[25] By emphasizing control and predictability, these metaphors align with a scientific paradigm that merges mechanistic philosophy with theological notions of mastery over creation.[26] Such frameworks have shaped historical environmental discourses and continue to inform contemporary imaginaries, portraying nature as a system requiring external governance, implicitly assuming the existence of a controlling engineer in a seductive yet reductive vision of governance and control.[27]

In sustainable AI discourses, multimodal metaphors further reinforce this worldview. Representations of Earth or nature as a network of data points or a digital system simplify ecological complexity into manageable abstractions, perpetuating the “myth of controllability”.[28] Tega Brain terms this the "fantasy of stability," where technological solutions are presumed capable of mastering nature’s intricacies. This perspective, rooted in a ‘data worldview’ [29], resonates with sustainability metaphors including "Nature is a Machine" [30] or "The Environment is Repairable", often encountered in geoengineering discourses. [31]

III. p. 85, Chunk 7: Earth’s Basilisk

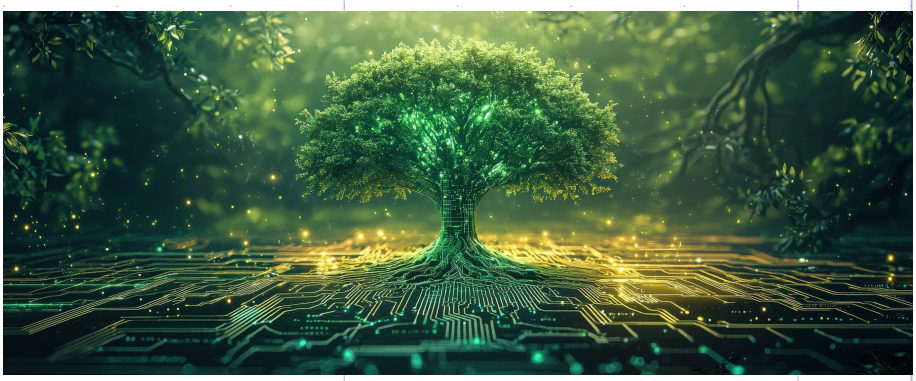

Figure 4: Nature is a (digital) Machine

The metaphorical framing of "Planet Earth as a (digital) system" reflects an anthropocentric vision of technological dominion. AI is increasingly

24: Maturana, H. R. and Varela, F. J. (1980) Autopoiesis and Cognition: The Realization of the Living. Dordrecht: Springer Netherlands.

25: Abram, D. (1991) 'The Mechanical and the Organic - On the Impact of Metaphor in Science', in Schneider, S. and Boston, P. (eds.) Scientists On Gaia. Cambridge, MA: MIT Press.

26: Latour, B. (2014) 'Some Advantages of the Notion of "Critical Zone" for Geopolitics', Procedia Earth and Planetary Science, 10, pp. 3-6.

27: Muir, S.A. (1994) 'THE WEB AND THE SPACESHIP: Metaphors of the Environment', ETC: A Review of General Semantics, 51(2), pp. 145-152.

28: Schneider, B. (2016a). Burning worlds of cartography: A critical approach to climate cosmograms of the Anthropocene. Geo: Geography and Environment, 3(2), e00027. Available at: https://doi.org/10.1002/geo2.27

29: Romele, A. (2020). The datafication of the worldview. AI and SOCIETY. Available at: https://doi.org/10.1007/s00146-020-00989-x

30: Stibbe, A. (2015). Ecolinguistics: Language, Ecology and the Stories We Live By. Routledge, Taylor and Francis Group.

31: Nerlich, B., and Jaspal, R. (2012). Metaphors We Die By? Geoengineering, Metaphors, and the Argument From Catastrophe. Metaphor and Symbol, 27(2), 131–147. Available at: https://doi.org/10.1080/10926488.2012.665795

positioned as the interface through which we perceive and interact with the environment, translating its complexities into data-driven models (see Figure 4).

Chunk 13 Such perspectives risk sidelining the need for embodied, experiential connections with nature, reducing it to an apparatus to be observed, optimized, and controlled.

Chunk 14 As such, the data-driven approach to environmental management simplifies the challenges of ecological stewardship and further perpetuates a vision of humanity as separate from and superior to the natural world, deepening the epistemological divide between humans and nature. [32]

Futures Implications of Technological Mastery

Contemporary depictions of AI and sustainability, particularly through the metaphor of “Earth as a digital system”, suggest that the “datafication” of our environment offers a solution to the climate crisis, implying that technological innovation alone can reverse large-scale environmental damage.[33] However, these portrayals conceal crucial ethical and ecological complexities. By framing nature as a system that can be monitored, controlled, and predicted through AI technologies, it overlooks the environmental costs of AI itself—carbon emissions, resource depletion, and labor exploitation—while reinforcing a narrow, technocentric view of sustainability.[34]

Such portrayals reduce ecosystems to manageable data points, oversimplifying nature's inherent unpredictability [35]. While AI applications may enhance environmental monitoring, the opacity of AI systems can limit understanding, substituting tactile engagement with algorithmic abstraction [36]. The assumption that more data yields a more accurate depiction of reality masks the complexities of data interpretation and reinforces misguided confidence in technological mastery.

This is where the promise of objectivity fails us: when we assume that more data will give us a more accurate picture of reality. In AI, there’s often an assumption that data-driven methods remove human bias and simply show the world as it is, but this overlooks the complexities behind how data is interpreted (Brain).

Ultimately, the digital system metaphor reinforces the idea that AI is the answer to our collective yearning to control the crisis technologically. Yet, this vision of technological mastery detaches us from the complex interdependencies of ecosystems and further limits the range of potential solutions.

Chunk 15 It benefits economic entities that profit from techno-fixes while reinforcing a narrow, technocentric view of sustainability. As Schneider (2016:7) warns, reducing nature to a system managed by technology deepens the divide between humanity and the natural world, fostering misplaced confidence in our ability to predict and control an inherently unpredictable future.

32: Rout, M., and Reid, J. (2020). Embracing indigenous metaphors: A new/old way of thinking about sustainability. Sustainability Science, 15(3), 945–954. Available at: https://doi.org/10.1007/s11625-020-00783-0

33: Erdmann, L., Cuhls, K., Warnke, P., Hüsing, B., Mangels, M., Meißner, L., Meissner, S., Röß, A., Fraunhofer-Institut für System- und Innovationsforschung ISI, Karlsruhe, Potthast, T., Bossert, L., Brand, C. and Ethikzentrum IZEW, Universität Tübingen (2022) 'Digitalisierung und Gemeinwohl – Transformationsnarrative zwischen Planetaren Grenzen und Künstlicher Intelligenz. Abschlussbericht.' TEXTE 29/2022. Dessau-Roßlau: Umweltbundesamt.

34: Coeckelbergh, M. (2022) Digital Technologies, Temporality, and the Politics of Co-Existence. Springer International Publishing. Available at: https://doi.org/10.1007/978-3-031-17982-2

35: Brain, T. (2018) 'The Environment Is Not A System', A Peer-Reviewed Journal About, 7(1), pp. 152- 165. DOI: 10.7146/aprja.v7i1.116062.

36: Romele, A. (2020). The datafication of the worldview. AI and SOCIETY. Available at: https://doi.org/10.1007/s00146-020-00989-x

The visual and linguistic lexicon of Sustainable AI reveals how confined our spaces for imagination and innovation truly are. These metaphors constrain the possibilities for meaningful systemic change and the solutions required to address the climate crisis.

Chunk 16 Rather than offering bold new visions, they reflect the struggle to conceive of a future distinct from the present, while perpetuating vague and often misleading assurances about technologies that are promised to resolve our existential challenges soon.

Chunk 17 Yet, whether these technologies will deliver remains uncertain, leaving us to question whether we can truly rely on technological fixes to address such complex global issues.

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