Soil governance and digital transformation in the African Union: a comparative legal analysis from a European Union perspective

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1. Introduction

The significance of digitalisation and environmental stewardship has gained increasing recognition, particularly considering the pressing imperative to safeguard the planet and its natural resources. Within this context of environmental protection and sustainable development, particular emphasis must be placed on soil, the foundation of terrestrial ecosystems and human existence.

Healthy soil is indispensable to food security, sustainable livelihoods, and long-term economic development, particularly in Africa, where a substantial proportion of the population relies on agriculture.[1] Soil also functions as a pillar of global supply chains and climate resilience, serving as a carbon sink, mitigating floods, droughts, and erosion, and sustaining biodiversity and essential ecosystem services.[2] Africa accounts for approximately 60%[3] of the world's remaining agricultural land, and 95% of all food production is contingent upon the maintenance of healthy soils.[4]

African soils are presently in a deplorable condition. Between 75 and 80% of the continent's arable land has already been degraded, resulting in an annual loss of approximately 30–60 kilograms of nutrients per hectare.[5] The drivers of soil degradation are multifaceted and largely anthropogenic, with unsustainable land-use practices, climate change, and excessive fertiliser use playing central roles. Additional contributing factors include overgrazing, mining activities, erosion, deforestation, industrial pollution, inadequately regulated foreign investment, rapid urbanisation, entrenched poverty, insecure land tenure, and global crises, such as the COVID-19 pandemic.[6]

Digitalisation and soil health are closely interlinked, as digital technologies can serve as effective tools for safeguarding soil health. In agriculture, digital tools increase productivity, improve efficiency, and promote sustainability, thereby supporting sound soil management.[7] Digital technologies facilitate systematic data collection and dissemination, enabling a shift from reactive responses to preventive and evidence-

1 AU (2024a: 7–8).
2 Ibid.: 10.
3 World Economic Forum (2024: 6).
4 Ibid.: 4.
5 AUDA-NEPAD (2023: 1–2).
6 Ginzky & Ruppel (2025b: 23–25).
7 Nalwinban (2024: 6).

based strategies.[8] Concrete initiatives, such as the Soil4Africa Project, illustrate the practical application of these technologies for soil health.[9]

At the same time, the adoption of digital technologies in Africa faces substantial barriers. Smallholder farmers face limited digital literacy, inadequate infrastructure, high costs, gender disparities, and language constraints, while digitalisation also entails risks, including cybercrime, labour displacement, and broader socio-economic challenges.[10] For digital tools to function effectively in soil protection, management, and monitoring, a coherent and comprehensive policy or legislative framework is indispensable.

Yet policies and regulations relating to soil and digitalisation, and their intersection, remain far from comprehensive. There is no binding continental regulatory framework addressing soil protection, digitalisation, or artificial intelligence, and initiatives such as the Soil Initiative for Africa remain non-binding.[11] Consequently, no comprehensive regime governs the use of digital tools for soil management and protection, revealing a significant lacuna in African legislation. Nevertheless, recent developments within the AU indicate emerging momentum with the Model Law on Soil Management in Africa signalling a potential shift towards a more coordinated regulatory approach.[12]

This chapter, partially based on several conference presentations and the author's master's thesis in law conducted at Stellenbosch University, examines the following central research question: "To what extent can the AU, inspired by the example of the EU and adapted to the institutional, cultural, and economic context of Africa, develop, implement, and enforce a regulatory instrument that regulates the use of digital tools for effective soil management, monitoring, and protection?"

To address this question, this chapter offers recommendations for the effective and comprehensive regulation of digital technologies as tools for soil management, protection, and monitoring within the AU, drawing on the EU example.

8 AU (2020: 33–35).
9 See https://www.soils4africa-h2020.eu/the-project, accessed 4 July 2025.
10 Nalwinban (2024: 23–27); see https://stemmenvanafrika.nl/talen-van-afrika/, accessed 4 July 2025.
11 AUDA-NEPAD (2023: 19).
12 See https://www.africanparliamentarynews.com/2025/11/pan-african-parliament-adopts-landmark_7.html, accessed 28 March 2026.

2. Soil, digitalisation, and the African context: legal framework and characteristics

2.1. The African Union's policy and legal instruments on soil and digitalisation

2.1.1. Soil governance and soil health

The prevailing regulatory and policy framework of the AU contains no explicit reference to soil; nonetheless, certain provisions may be regarded as indirectly pertinent. The Constitutive Act, notably Article 13(1)(c), which enumerates areas intrinsically connected to soil use and management, is indirectly relevant.[13] Beyond the Constitutive Act, the AU's policy ambitions are articulated in Agenda 2063, its long-term strategic framework. Although the Agenda does not establish a dedicated soil policy, it does acknowledge issues closely connected to soil governance, such as erosion and fertility.[14]

In contrast to indirect references to soil in the AU's core instruments, regional conventions and treaties provide explicit legal provisions on soil protection. The most notable in this regard is the Revised African Convention on the Conservation of Nature and Natural Resources, which remains the sole continental instrument to prescribe specific measures relating to soil.[15]

In addition to binding regulations, conventions, and treaties, the governance of soil in Africa is shaped by a range of soft-law instruments, including the Draft African Union Strategy on Climate Change, the Climate Change and Resilient Development Strategy and Action Plan for Africa, and the Nairobi Declaration on Climate Change.[16]

While these climate-oriented instruments address soil only indirectly, a second set of frameworks has emerged with a more explicit focus on agriculture and soil governance. These initiatives, though likewise non-binding, are designed specifically to tackle soil degradation and to promote sustainable soil management across the continent. Central to this is the New Partnership for Africa's Development (NEPAD), established to guide member states in pursuing their development objectives. Within this framework, the Comprehensive Africa Agriculture Development Programme (CAADP) was formulated as a policy instrument to promote sustainable agriculture, enhance food security, and stimulate economic growth. As one of the central pillars of Agenda 2063, CAADP has also provided the institutional basis for the African Union Commission's 2020 call to create a Soil Initiative for Africa (SIA). The SIA seeks to address soil degradation through innovative fertiliser use, the application of proven technologies, and the development of enabling policies and institutions to sustain long-term soil management. It is structured around two principal components: the Draft

13 Art 13(1)(c) Constitutive Act of the African Union 2000.
14 See https://www.nepad.org/agenda2063, accessed 25 September 2025.
15 Kassner & Ruppel (2025: 760-770).
16 Ibid.: 770–774.

Framework Document of the Soil Initiative for Africa and the African Fertiliser and Soil Health Action Plan (AFSH Action Plan). The SIA is conceived as a long-term initiative, with an evaluation planned after the first ten years to inform the next decennial plan.[17]

In addition to AU initiatives, the African Soil Partnership, established under the Food and Agriculture Organisation's Global Soil Partnership, supports African states in protecting and sustainably managing their soil resources through coordinated regional action. While non-binding, it underscores the importance of international cooperation and capacity-building in African soil governance, complementing efforts under NEPAD, CAADP, and the SIA.[18] Against this background of largely indirect and non-binding instruments, the Model Law on Soil Management represents a notable step towards greater normative coherence.

On the diplomatic front, at the twentieth session of the African Ministerial Conference on the Environment (AMCEN), held in July 2025, African environment ministers adopted Decision AMCEN/20/Dec.1, which aims to Strengthen Soil Governance and Land Restoration in Africa. The Decision called for the development of guidelines for a continental soil governance framework.[19] During the Sixth Ordinary Session of its Sixth Legislature on 6 November 2025, the Pan-African Parliament (PAP) adopted the continent's first Model Law on Soil Management.[20] With this, Africa has taken a historic step forward for sustainable development, food security, and environmental protection. Officially titled "Model Law on Soil Management in Africa", it provides countries with a model legal framework to safeguard their soils and strengthen resilience to climate change. It encompasses all dimensions of soil governance, including sustainable agriculture and food security, climate mitigation and adaptation, soil use regulation and planning, data management, digitalisation and innovation, public participation, indigenous knowledge, and gender equity. Additionally, it addresses rehabilitation, enforcement, and dispute settlement mechanisms. The Model Law includes a full section on Soil Data, Digitalisation, Monitoring, and Innovation.[21] Following the PAP's adoption of the Model Law, the resolution is normally forwarded to the AU Assembly of Heads of State and Government for final approval. Once approved, the Model Law can be sent to and disseminated among national parliaments and the public. The Model Law for Soil Management in Africa includes a toolbox for domestication and implementation designed to contribute to more coordinated soil governance across the African continent. The Model Law can contribute to a more effective integrated soil protection agenda, which, in turn, favours land degradation

17 AU (2024a: 1).

18 See https://www.fao.org/global-soil-partnership/regional-partnerships/africa/en/, accessed 6 July 2025.

19 Ruppel & Murray (2025).

20 See https://pap.au.int/en/news/press-releases/2025-11-06/african-parliamentarians-adopt-continents-first-model-law, accessed 28 March 2026.

21 Ibid.

neutrality (LDN), enhances land and soil restoration and soil health, in the interest of climate change resilience, and supports more biodiversity protection, re-naturalisation, and food security. Moreover, the Model Law can serve as a blueprint piece of legislation—together with an implementation toolbox—that can also digitally enable domestic legislators to create, monitor, and implement tailored soil legislation to support more coordinated soil management, protection, monitoring, and enforcement.

2.1.2. AI and other digital tools

While the preceding section has outlined the legal and policy dimensions of soil governance and soil health, it is equally necessary to consider the emerging role of digital technologies and the corresponding policy and legal instruments.

The Government AI Readiness Index indicates that Sub-Saharan Africa faces significant structural obstacles to AI adoption, including a lack of reliable official data, weak and fragmented governance structures, and ongoing political instability. Although private actors and citizens are not formally precluded from deploying AI tools, the absence of institutional support and accessible data constrains their effective use. Progress is required not only in building the necessary technological infrastructure but also in establishing coherent regulatory frameworks that ensure legitimacy, accountability, and legal certainty in the use of AI.[22]

Notwithstanding the absence of a comprehensive regulatory framework safeguarding the continent from the risks associated with AI and other digital technologies, the governance of AI has begun to attract growing institutional attention within the AU. The 2019 Sharm el-Sheikh Declaration reaffirmed earlier AU decisions and strategies, including the Policy and Regulatory Initiative for Digital Africa (PRIDA), and articulated the ambition of creating an integrated and inclusive digital society. It further mandated the promotion of the Digital Transformation Strategy for Africa (2020–2030), the ratification of the Malabo Convention, and the establishment of an AI working group.[23] In 2024, the AU Executive Council adopted the Continental Artificial Intelligence Strategy for Africa, aimed at advancing national AI strategies, governance frameworks, capacity-building initiatives, and resource mobilisation.[24]

Complementing these efforts, the African Commission on Human and Peoples' Rights adopted Resolution No. 473 in 2021, calling for a regulatory framework ensuring that AI deployment remains aligned with the needs and aspirations of African

22 Fuentes et al. (2021: 5 & 44–46).

23 African Union (Specialised Technical Committee on Communication and Information Technologies) 2019 Sharm El Sheikh Declaration AU/STS-CICT-3/MIN/Decl. 3-7.

24 AU (2024b: 1); see https://www.whitecase.com/insight-our-thinking/ai-watch-global-regulatory-tracker-african-union, accessed 7 July 2025.

populations.[25] At the continental level, the most significant binding instrument remains the African Union Convention on Cyber Security and Personal Data Protection (the Malabo Convention), which entered into force in 2023 and establishes a legal framework governing electronic commerce, data protection, cybercrime, and cybersecurity, although only fifteen states have ratified it.[26] In parallel, several member states have developed national AI strategies and institutional mechanisms, reflecting a fragmented but emerging pattern of regulatory convergence. The development of AI governance on the continent thus remains in an incipient stage.[27]

2.1.3. The intersection between soil and digitalisation

Having considered the AU's policy and legal instruments on soil governance and on AI and other digital tools, it is necessary to examine the extent to which these domains converge. The central question is whether continental regulation and policy initiatives explicitly address the intersection of soil governance and digitalisation, namely the digitisation of soil management, protection, and monitoring.

The Continental Artificial Intelligence Strategy for Africa identifies agriculture as one of its key priority sectors, aligning its focus areas with Agenda 2063 and the Sustainable Development Goals (SDGs). The Strategy acknowledges that digital technologies are already being applied on a limited scale in agriculture and advances recommendations to promote the wider adoption of AI, support member states in integrating AI into the agricultural sector, establish centres of excellence, and raise awareness of both the potential benefits and risks of AI use. While these recommendations relate primarily to agriculture more broadly rather than to soil, they are directly relevant to soil protection, management, and monitoring.[28]

The Soil Initiative for Africa likewise identifies digital technologies as instruments to advance soil protection and management. Priority Area 1 provides that digital technologies may be utilised and that access to such tools should be ensured. Priority Area 2 highlights the importance of leveraging digitally enabled products and services, and Priority Area 3 underscores the need to establish effective soil information systems to support data-driven decision-making and monitoring. By contrast, Priority Area 4 does not explicitly address the regulation of digital technologies.[29] Taken together, the aforementioned instruments acknowledge the potential of digitalisation for soil management, protection, and monitoring, yet they fall short of providing a coherent regulatory

25 ALT Advisory (2022: 6).
26 Ibid.: 6–7.
27 Fuentes et al. (2021: 44–46).
28 AU (2024b: 38).
29 AU (2024b: 7–12).

framework to address the specific legal challenges posed by the digitisation of soil governance.

2.2. Critical analysis of the legal and policy framework

A central concern is the considerable gaps in African legislation regarding soil, digitalisation, and their intersection. At present, there exists neither a comprehensive nor a binding regulatory framework specifically dedicated to soil protection, management, and monitoring, nor a framework capable of governing the use of digital technologies in soil governance and mitigating the risks associated with their deployment.[30] Although significant gaps remain, a recent normative development, the adoption of a continental Model Law on Soil Management by the Pan-African Parliament, demonstrates an emerging shift towards more structured soil governance.

Implementation deficiencies further undermine effectiveness. AU member states are under no obligation to submit implementation reports under the African Convention on the Conservation of Nature and Natural Resources, and, in the absence of a dedicated supervisory body and amid chronic financial constraints, this weakens compliance.[31] Similar shortcomings characterise AI governance, where national initiatives remain isolated and poorly coordinated, leading to overlaps and gaps in regulatory frameworks. Although a Continental AI Strategy has been adopted, its objectives still need to be translated into enforceable measures, leaving the AU with the dual challenge of harmonising national initiatives while respecting member states' sovereignty.[32]

The rapid pace of technological progress in artificial intelligence requires regulatory and policy frameworks that are sufficiently flexible to adapt without constant reform, yet acute infrastructure deficits in Africa hinder the establishment of coherent and unified AI governance. At the same time, the growing influence of international corporations raises concerns of "AI colonialism", whereby African states risk becoming passive consumers of externally developed technologies rather than active participants in shaping and deploying them, thereby affecting regulatory autonomy and long-term digital sovereignty.[33] Data regulation presents additional challenges, as prevailing frameworks emphasise individual privacy and neglect the collective dimension of data, allowing private corporations to exploit unprotected collective data to the detriment of farmers. Farmers, as primary stakeholders, are often excluded from policymaking processes and lack the financial and technical resources required to utilise digital technologies.[34] Finally, while the continent has produced numerous soft-law instruments, their

30 Kassner & Ruppel (2025: 761–762).
31 Ibid.
32 ALT Advisory (2022: 13).
33 Njoroge (2024).
34 Canfield & Ntamabirweki (2024).

non-binding nature results in weaker compliance. Although binding frameworks are called for to ensure consistency and enforcement, such instruments often prove more cautious and less ambitious in their regulatory scope.[35]

2.3. Contextual factors affecting policy creation, implementation, and enforcement

The shortcomings in AU frameworks on soil governance and digitalisation are intertwined with broader political, institutional, and economic conditions that shape policy creation, implementation, and enforcement. The AU, composed of 55 member states and possessing both intergovernmental and limited supranational characteristics, adopts decisions through a consensus-based process involving the Assembly, the Executive Council, the Specialised Technical Committees (STCs), the AU Commission, and other bodies. Legislative initiatives originate from the Commission, member states, or STCs, are reviewed by the Permanent Representatives' Committee, and ultimately require approval by the Executive Council or Assembly, with decision-making generally proceeding by consensus.[36]

Reliance on consensus slows responses to crises and results in diluted policies based on the lowest common denominator. Although member states are formally equal, more powerful states exert informal influence through economic, diplomatic, or military leverage, and the process lacks transparency due to undisclosed negotiations. Divergences in culture and policy priorities further complicate consensus, while the Pan-African Parliament's lack of genuine legislative authority so far undermines the Union's democratic legitimacy.[37] While this seems to be gradually changing, the soil protection status on the African continent remains weak: there is a severe lack of dedicated soil protection laws, soil protection responsibilities are highly fragmented, weak governance leads to inconsistent policy implementation, and difficulties in tracking progress in soil protection persist. Many existing soil-related laws are outdated, failing to incorporate modern conservation techniques or reflect the latest scientific knowledge. As a result, they are ineffective at addressing contemporary challenges such as climate change, soil erosion, food insecurity, and the demands of growing industrial agriculture. Public knowledge about soil health is generally low. There are limited education and training programs for farmers, and extension services are scarce. This leaves many communities unaware of proper soil management practices, exacerbating soil degradation. Soil data is often not collected or is inaccessible, hindering farmers and communities from assessing soil health or advocating for its protection. Uncertainty over land ownership, especially in communal systems, discourages long-term investment in soil care.

35 Kassner & Ruppel (2025: 778).
36 Amani Africa (2022: 2 & 10–21).
37 Ncube (2020).

Conflicts between traditional and statutory laws further complicate soil protection efforts, with many communities unaware of their land rights and therefore easily violating national land tenure laws. In many African countries, there is inadequate regulation of foreign investments in land use. This results in unsustainable land practices and soil degradation, as foreign investors typically prioritise short-term profits over long-term soil health. Rural and marginalised communities face significant barriers to accessing legal action to protect soil, allowing soil degradation to continue unchecked and leaving these communities vulnerable to unsustainable land-use practices. Therefore, the new Model Law on Soil Management provides a toolbox of options and approaches to support national parliaments in developing domestic solutions tailored to national challenges and purposes.

Although the AU adopts regulations, directives, recommendations, declarations, and resolutions, ambiguously drafted decisions at times hinder their effective execution. Insufficient financial resources further undermine implementation. Reliance on external donors, underutilised resources, bureaucratic inefficiencies, and weak follow-up and accountability mechanisms compound these challenges, while fragmentation among member states and limited coordination prevent the consistent application of the instruments adopted.[38]

Enforcement mechanisms exist under Articles 23 and 4(h) of the Constitutive Act, allowing sanctions and intervention in cases of serious violations, with the Assembly and Peace and Security Council (PSC) playing central roles and the African Court on Human and Peoples' Rights issuing binding judgments.[39] In practice, however, sanctions have shown a limited deterrent effect due to weak coordination with the Regional Economic Communities (RECs) and the Regional Mechanisms,[40] normative inconsistency,[41] insufficient political will, and inadequate technical and financial resources.

3. The European Union framework

3.1. The European Union's policy and legal instruments on soil and digitalisation

3.1.1. Soil governance and soil health

Since the Single European Act of 1987, the EU has held competence to regulate soil protection. Although for decades no legal instrument had been dedicated exclusively

38 See https://issafrica.org/iss-today/why-arent-more-african-union-decisions-on-security-implemented, accessed 9 July 2025.

39 Amani Africa (2022: 11–13 & 19).

40 See https://au.int/en/recs, accessed 9 July 2025; https://au.int/en/directorates/about-conflict-management, accessed 9 July 2025.

41 Arts 3, 5(1) & 22 of the Protocol on Relations between the African Union (AU) and the Regional Economic Communities (RECs) (25 January 2008) signed on 27 January 2008.

to soil, the issue has increasingly attracted attention across a wide range of EU strategies, most notably the European Green Deal. The Green Deal is a comprehensive development strategy that indirectly addresses soil-related concerns through its broader commitments to climate action and biodiversity preservation. To complement the commitments of the Green Deal, the EU Soil Strategy for 2030 was adopted in November 2021. The Soil Strategy sets medium-term targets for 2030 and long-term objectives for 2050.[42] It calls for the development of a dedicated legislative proposal on soil health and for intensified research, data collection, and monitoring.[43]

To give effect to these commitments, the EU adopted the EU Soil Monitoring and Resilience Directive (Soil Monitoring Law), which entered into force on 16 December 2025 and is the first comprehensive, dedicated legislative instrument for soil-related challenges. The EU member states have until 16 December 2028 to transpose the Directive's provisions into their national legal systems. The first reporting deadline concerning the implementation of the Directive and the assessment of soil health is set for 16 December 2031.[44]

The law's primary objective is to address the principal threats to European soils, namely erosion, loss of soil organic matter, salinisation, contamination, compaction and sealing, and the loss of soil biodiversity. In addition, the legislation addresses all dimensions of soil degradation and applies to all soil types, including forest, urban, and agricultural soils. The Directive establishes the legal framework necessary to achieve healthy soils across the European Union by 2050.

To attain these objectives, the Directive establishes several key measures. It requires member states to systematically monitor and assess soil health, supports farmers and other land managers in enhancing soil resilience, and introduces specific provisions to address contaminated sites within the EU. Moreover, it promotes the generation and dissemination of knowledge on soil conditions, thereby reinforcing the EU's climate and biodiversity objectives and its broader commitments to competitiveness and food security.[45]

The adoption of this legislative instrument must be understood within the broader framework of the EU's environmental competencies. Under Article 192(1) of the Treaty on the Functioning of the European Union (TFEU), the EU is empowered to act in the field of environmental policy, with the European Commission holding the right of legislative initiative. The justification lies in the transboundary nature of soil degradation, whose consequences extend beyond national borders and cannot be effectively contained by individual member states. Moreover, reliance solely on national action risks generating distortions in competition, since the stringency of environmental

42 Heuse (2022: 3-4).

43 See https://environment.ec.europa.eu/topics/soil-health/soil-strategy-2030_en, accessed 9 July 2025.

44 See https://www.consilium.europa.eu/nl/press/press-releases/2024/06/17/soil-monitoring-law-eu-on-the-pathway-to-healthy-soils-by-2050/, accessed 9 July 2025.

45 See https://environment.ec.europa.eu/topics/soil-health/soil-monitoring-law_en#timeline, accessed 3 March 2026.

regulation would vary considerably across member states. The Directive, therefore, seeks to close legal gaps and to strengthen the internal market by harmonising environmental standards across the Union.

In this light, the Commission has opted for a directive rather than a regulation. By selecting a directive, the Commission allowed member states discretion in its implementation, ensuring adaptation to national contexts while aligning with Union-wide objectives.[46]

3.1.2. AI and other digital tools

While the previous section examined the European Union's soil-related strategies and the adopted EU Soil Monitoring and Resilience Directive, the analysis would be incomplete without the parallel developments in digital regulation.

Several legislative instruments provide direct support for technological innovation and digital infrastructure, including the Digital Europe Programme Regulation, Horizon Europe, the Pilot Regime for Distributed Ledger Technology, and the European Chips Act, while additional instruments address digital connectivity, data governance, intellectual property, cybersecurity, consumer protection, and the digital transformation of the financial sector. In sum, the Union is progressively shaping the digital transition through a broad legislative programme that addresses innovation, infrastructure, data governance, cybersecurity, competition, and consumer protection to construct a secure, fair, and future-proof digital environment.[47]

Attention is devoted to the EU AI Act, which constitutes the cornerstone of the Union's regulatory approach to artificial intelligence. The EU AI Act (Regulation (EU) 2024/1684), adopted in July 2024, establishes the conditions under which artificial intelligence systems may access the European Single Market. Its dual objective is, on the one hand, to mitigate risks associated with the deployment of AI, and, on the other, to foster innovation within the Union. The Act reflects the Union's broader endeavour to strike an appropriate balance between trust, the protection of fundamental rights, and the operation of market forces.[48]

The EU AI Act adopts a risk-based regulatory approach. It distinguishes between four levels of risk: unacceptable risk, high risk, limited or transparency risk, and minimal or no risk. Systems categorised as presenting an unacceptable risk are strictly prohibited. High-risk systems may be placed on the market only if they comply with stringent regulatory obligations. Limited-risk systems are subject to transparency requirements, obliging providers, namely the developers or entities placing AI systems on the Union market, to disclose the use of AI where necessary to preserve trust. Such

46 European Commission (2023: 9–11).
47 Meuck et al. (2025: 21–50).
48 Ibid.: 53–55.

providers must also ensure that AI-generated content is identifiable and, in certain circumstances, clearly and visibly labelled. By contrast, AI systems assessed as entailing minimal or no risk remain outside the scope of specific regulatory obligations.[49]

Each member state is required to designate a supervisory authority responsible for ensuring compliance with the rules applicable to high-risk AI systems and for withdrawing non-compliant products from the market. At the Union level, supervisory competences are distributed among several institutions. A newly established AI Office serves as the central authority for supervising powerful general-purpose AI models. Within the Commission, the Directorate-General for Communications Networks, Content, and Technology (DG CNECT) assumes responsibility for innovation policy, information and communications technology, and emerging technologies. In addition, the European Artificial Intelligence Board convenes national supervisory authorities from all member states to coordinate implementation.[50] General-purpose AI (GPAI) models are subject to a distinct regime. They must comply with specific transparency obligations and, where they pose systemic risk, implement comprehensive risk management measures.[51]

3.1.3. The intersection between soil and digitalisation

The Soil Strategy for 2030 expressly acknowledges digitalisation as an instrument for protecting and monitoring soils. In its Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, the Commission observed that "we need to know more about soil". The Commission identifies three dimensions of this objective: the digital agenda, soil data and monitoring, and soil research and innovation.[52]

Within the 'soil and digital agenda', the Union emphasises the use of digital technologies to strengthen soil governance. A central element is the Copernicus Programme.[53] The Soil Strategy calls for greater reliance on the Joint Research Centre to develop the European Soil Observatory (EUSO) and on the European Environment Agency to establish the Land Information System for Europe (LISE).[54]

Alongside the digital agenda, the Soil Strategy highlights the need for reliable data and systematic monitoring, building on the Land Use/Cover Area Frame Survey (LUCAS). The Strategy proposes creating a stronger legal basis for the LUCAS soil

49 See https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-ai, accessed 11 July 2025.
50 Meuck et al. (2025: 56).
51 Ibid.: 58–60 & 64–65.
52 European Commission *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Soil Strategy* COM (2021) 699 Final 20-23.
53 See https://www.copernicus.eu/en, accessed 3 August 2025.
54 European Commission Communication (2021: 20).

module.[55] In addition to monitoring, the Soil Strategy places strong emphasis on research and innovation. It calls for the establishment of large-scale, carefully designed programmes to generate further knowledge on sustainable soil management. The Strategy also highlights the close link between innovation and digitalisation. Because innovative approaches often rely on costly digital methods and data-driven research, their effectiveness depends on sustained investment. Of particular importance is the explicit call to promote the development and deployment of digital and remote sensors, mobile applications, and portable measuring instruments for assessing soil quality.[56]

The EU Soil Monitoring and Resilience Directive's articles do not themselves regulate or mandate the use of digital tools for soil protection, management, or monitoring. While the Directive anticipates the use of remote sensing products and refers to establishing a digital portal with publicly accessible georeferenced data, these elements serve primarily as supportive instruments for data collection and transparency rather than as legally binding obligations to deploy specific digital technologies.[57] The Directive is designed to reinforce and operate alongside the land use, land-use change, and forestry (LULUCF) framework. It therefore strengthens harmonised monitoring and reporting structures but contains no provision that imposes a general obligation on member states to deploy, standardise, or regulate digital tools or artificial intelligence systems in soil governance.[58] In fact, the Directive created an EU-wide soil health monitoring framework that mandates comparable soil data, contaminated-site remediation planning, and measures on land take and emerging contaminants, thereby offering a regulatory benchmark for other regions.[59]

The EU AI Act establishes a risk-based regulatory framework governing the placing on the market, the use, and the supervision of AI systems within the Union. Article 6, read together with Annex III, identifies sectors that are automatically designated as high risk unless it can be demonstrated that they do not pose a significant threat to health, safety, or fundamental rights. Agriculture and soil are not expressly included in Annex III. Nevertheless, digital systems used in soil management may fall within Annex III (2) when they form part of, or directly affect, the functioning of critical infrastructure sectors, such as water management, food supply systems, or environmental monitoring networks. In such cases, their classification would depend not on the agricultural nature of the system itself, but on its functional integration into infrastructure designated as critical under the Act.[60]

55 See https://joint-research-centre.ec.europa.eu/eu-soil-observatory-euso_en, accessed 3 August 2025; European Commission (2021: 21–22).

56 European Commission Communication (2021: 22).

57 See https://www.cuatrecasas.com/resources/new-eu-directive-on-soil-monitoring-and-resilience-694519fda4ab1032692762.pdf, accessed 3 March 2026.

58 European Commission (2023: 7–9).

59 Ruppel & Murray (2025: 13).

60 Annex III (2) Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 Laying Down Harmonised Rules on Artificial Intelligence and Amending Regulations (2024).

3.2. Critical analysis of the legal and policy framework

The EU has established an ambitious framework for soil and AI. The Soil Strategy for 2030 outlines clear policy goals, the EU Soil Monitoring and Resilience Directive is the first-ever Soil Monitoring Law, and the AI Act introduces a comprehensive, risk-based system for AI governance. However, several shortcomings have been identified.

The EU Soil Monitoring and Resilience Directive does not establish legally binding targets.[61] It focuses on monitoring, assessment, reporting, and the principles of sustainable soil management.[62] Member states are required to establish systems to systematically monitor and assess soil health in accordance with common descriptors and EU methodologies. Furthermore, member states must periodically report to the European Commission and the European Environment Agency (EEA) on soil health, land take, and contaminated sites to ensure comparability.[63] The Directive also mandates the identification, registration, and risk assessment of contaminated sites, with the relevant information being made publicly accessible. In addition, it provides for the development of EU-level data platforms, *inter alia*, building upon the EU Soil Observatory, with technical support from the Commission.[64] Concerning soil monitoring and digitalisation, the Directive also devotes explicit attention to these aspects. The use of remote sensing products is anticipated, along with the establishment of a digital portal that provides public access to georeferenced data. However, the Directive does not provide specific provisions governing the use of artificial intelligence, nor does it mandate the use of digital soil-monitoring tools.[65]

Under the EU AI Act, providers of AI systems may determine internally whether their systems qualify as high-risk. Prior approval by a supervisory authority is not foreseen. While AI systems must be registered in a publicly accessible database, the underlying risk assessments are not disclosed. Only competent authorities may request such information, which, in turn, raises concerns about transparency and effective supervision. A further point of discussion concerns the elaboration of technical standards. Responsibility in this regard lies with European standardisation organisations, whose membership includes industrial actors. Critics have argued that these bodies are not sufficiently democratically legitimised, as civil society organisations have limited representation and no voting rights.[66] At the same time, the EU AI Act introduces

61 See https://eeb.org/a-weak-deal-for-europes-soils, accessed 12 July 2025.

62 Directive (EU) 2025/2360 of the European Parliament and of the Council of 12 November 2025 on Soil Monitoring and Resilience (Soil Monitoring Law) OJ L, 2025/2360, 26.11.2025.

63 See https://www.consilium.europa.eu/en/press/press-releases/2025/09/29/council-adopts-new-rules-for-healthier-and-more-resilient-european-soils/, accessed 3 March 2026.

64 See https://mission-soil-platform.ec.europa.eu/news-events/latest-news/soil-monitoring-law-published-eu-official-journal, accessed 3 March 2026.

65 See https://www.cuatrecasas.com/resources/new-eu-directive-on-soil-monitoring-and-resilience-694519fda4ab1032692762.pdf, accessed 3 March 2026.

66 Wachters (2024: 671–718).

important safeguards and benefits for agriculture and soil governance. By regulating the use of AI technologies, the Act has the potential to contribute to more sustainable agricultural practices and to improved soil health across the Union.[67]

3.3. Contextual factors affecting policy creation, implementation, and enforcement

The EU adopts a range of legal instruments, including regulations, directives, decisions, recommendations, and opinions. Once an agreement is reached, the legislative act is formally adopted and must be implemented by the member states.[68] One such factor influencing decision-making is the theory of intergovernmentalism, which views international cooperation as a partnership of sovereign states that pool sovereignty only when it serves their interests and highlights how member-state preferences are rooted in domestic political and economic pressures.[69] A further determinant of decision-making is the Union's cultural diversity, as the EU is characterised by the coexistence of distinct national cultures and an institutional framework that promotes dialogue, mutual respect, and equality among member states.[70]

When implementing EU law, it is essential to recognise the characteristics of each type of legal instrument. The primary responsibility for the correct and timely implementation of Union law lies with the member states. The European Commission is charged with ensuring compliance across the Union.[71] To carry out its supervisory role, the Commission uses guidelines, implementation plans, networks of national experts, conformity checks, legal assessments, inspections, and reporting obligations. In performing these tasks, the Commission follows a strategy of "Smart Enforcement", prioritising the prevention of infringements, assisting member states in implementation, and detecting serious or recurring breaches.

The complexity of a legislative instrument significantly affects its implementation. Institutional and administrative capacity, limited resources, and political considerations within member states may hinder compliance. The discretion afforded to member states can create scope for divergent application, leading to differentiated implementation across the Union.[72] The enforcement process is structured in several stages. At the outset, the European Commission gathers information concerning potential instances of non-compliance. Where indications of non-compliance arise, the Commission may initiate a pre-litigation phase, followed by a formal infringement procedure

67 See https://babl.ai/navigating-the-new-frontier-how-the-eu-ai-act-will-impact-the-agriculture-industry/, accessed 12 July 2025.
68 Germond (2016).
69 Hooghe & Marks (2019: 1115–1116).
70 Munos (2017: 150-151 & 154–158).
71 Art 288 of the Treaty on the Functioning of the European Union signed on 11-12-2007 and came into force on 1-12-2009 (OJ C 326/47).
72 Zhelyazkova et al. (2023: 454–456).

under Article 258 of the TFEU. If the member state does not comply, the Commission may refer the case to the Court of Justice of the European Union. When the Court finds a breach, the judgment is binding. Under Article 260 of the TFEU, the Court may impose financial penalties until the member state complies.

In practice, however, the effectiveness of this system is constrained by structural and political factors. The Commission exercises discretion in prioritising cases according to political feasibility, institutional capacity, and the sensitivity of the policy area concerned, and initiates formal proceedings less frequently against larger and more influential member states, as informal or diplomatic solutions are often preferred to formal legal action. Moreover, the infringement procedure is often slow and vulnerable to delaying tactics, places only minimal pressure on member states in its early phases, and keeps communications between the Commission and the member states confidential, thereby restricting public scrutiny and undermining trust in the Union's institutions.[73]

4. A legal comparison between the AU and the EU

Based on the previous sections, this part undertakes a structured comparative analysis of the AU and the EU to identify shared approaches, divergences, and potential lessons for regulating the utilisation of digital tools in soil protection and management.

4.1. Comparative analysis of legal and policy frameworks for soil and digital governance

4.1.1. Soil governance and soil health

The AU currently lacks binding legislation specifically dedicated to soil protection, monitoring, and management. However, an important recent development warrants attention: the Model Law on Soil Management in Africa marks the AU's first structured, continental attempt to consolidate soil governance within a comprehensive legal framework. Beyond this recent development, soil governance at the continental level remains characterised by indirect references rather than explicit regulation. The Constitutive Act and Agenda 2063 contain only indirect references to soil-related issues, and, apart from the Model Law, no explicit binding regulatory framework has been adopted at the AU level. The only binding instrument so far that indirectly addresses soil health, the African Convention on the Conservation of Nature and Natural Resources, is significantly constrained by weak implementation and monitoring

73 Toshkov (2016).

mechanisms, partly due to limited financial resources. In addition, several non-binding policy instruments, including the Soil Initiative for Africa and the African Fertiliser and Soil Health Action Plan, reflect recognition of soil health, while other policy documents address soil-related matters indirectly. Nevertheless, the absence of a comprehensive, binding legal framework has led to a fragmented, largely aspirational approach.

By contrast, the EU has adopted a more structured legal and policy framework. The EU Soil Strategy for 2030 establishes clear objectives for achieving healthy soils by 2030 and 2050, which are translated into binding legislation through the recently adopted EU Soil Monitoring and Resilience Directive. The Directive is the first relatively comprehensive legislative instrument dedicated specifically to soil-related challenges within the Union. It introduces harmonised monitoring and assessment requirements, obliges member states to establish systematic soil health monitoring systems based on common descriptors and methodologies, and requires periodic reporting to the European Commission and the European Environment Agency to ensure comparability. It further provides for the identification, registration, and risk assessment of contaminated sites, the public accessibility of relevant information, and the development of EU-level data platforms building upon the EU Soil Observatory, thereby strengthening transparency and knowledge generation across the Union.

Although discretion afforded to member states may limit its effectiveness, the EU framework demonstrates a stronger move toward legal consolidation. While the EU has adopted the first comprehensive Soil Monitoring and Resilience Directive, its framework remains primarily monitoring-focused and does not yet integrate all dimensions of soil protection into a single regulatory regime.[74]

4.1.2. AI and other digital transformation tools

The regulatory approaches of the AU and the EU concerning AI differ in their underlying philosophy, legal force, and institutional design. The EU adopts a binding, risk-based regulatory model through the EU AI Act, establishing a centralised governance framework at the Union level. By contrast, the AU's Continental AI Strategy is structured around five pillars and advocates flexible and adaptive regulatory models tailored to member states' specific contexts, rather than prescribing detailed legal obligations.

Institutionally, the divergence is equally pronounced. The AU's approach is characterised by coordination rather than enforcement: the African Union Commission serves as a high-level coordinating body, facilitating cooperation and promoting collaboration among member states and regional actors. This advisory and participatory

74 Kassner & Ruppel (2025: 786–790).

design reflects a bottom-up model that respects the sovereignty and varying capacities of member states. The EU, by contrast, has established a centralised, enforcement-oriented governance structure through the European Artificial Intelligence Board, which ensures consistent interpretation and application of the AI Act and coordinates national enforcement efforts, thereby securing uniformity and legal certainty across the Union.

Despite these structural differences, both organisations recognise the strategic importance of AI and digitalisation and seek to promote responsible governance. However, whereas the EU relies on binding legal obligations and supranational enforcement mechanisms, the AU operates through soft-law instruments and national-level implementation within a continental strategic framework, resulting in differing levels of regulatory uniformity and enforceability.[75]

4.1.3. Intersection between digitalisation and soil

The AU so far lacks legal instruments regulating the digitisation of soil protection, monitoring, and management. The new Model Law on Soil Management in Africa, however, represents a normative step towards addressing this gap.[76] In addition, policy instruments such as the Soil Initiative for Africa and the Continental AI Strategy acknowledge the relevance of digital technologies for agriculture and soil health, although they do not provide detailed regulatory guidance on soil-specific digital applications.

By contrast, the EU has explicitly linked digitalisation to soil protection and monitoring. While the EU Soil Monitoring and Resilience Directive recognises, in its recitals, the need to establish a digital soil health data portal at Union level, it does not impose a direct, binding obligation on member states to create or operate such a portal. Nevertheless, the binding requirements for harmonised monitoring, georeferenced data collection, reporting, and public registers indirectly necessitate the development of digital data systems at the national and Union levels.[77] However, the EU AI Act does not specifically address soil management, although relevant systems fall within its risk-based framework.

A further divergence lies in digital infrastructure. The EU operates through interconnected systems, such as LUCAS and Copernicus, embedded within a coherent legal and policy framework.[78] In the AU, digitalisation efforts remain predominantly

75 Policy Network on Artificial Intelligence (AI) (2024: 10); Njoroge (2024: 2-4).

76 See https://www.su.ac.za/en/news/pan-african-parliament-adopts-continents-first-model-law-sustainable-soil-management, accessed 28 March 2026.

77 Cf. https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=OJ:L_202502360, accessed 28 March 2026.

78 European Commission (2021c: 20–22).

project-based and are not anchored within a broader legal framework, and the absence of harmonised technical standards limits coordination at the continental level.[79]

The two regions also diverge in financial and infrastructural support. The EU provides dedicated funding for digital infrastructure in the soil sector, whereas limited financial resources and infrastructural constraints hinder implementation within the AU.[80] In sum, while both the EU and the AU recognise the importance of digital tools in soil governance, the EU's approach is more advanced and more legally and institutionally embedded.

4.2. Comparative analysis of norm hierarchy and legal force

The extent of the authority and legal influence exercised by the EU and the AU is shaped by the depth of regional integration achieved within each organisation. In the EU, integration has evolved into a sophisticated political and legal union. By contrast, the AU's integration trajectory has been more complex and uneven, shaped by political diversity and differing levels of state capacity.[81]

EU and AU law distinguish among several legal instruments that reflect different degrees of legal force and methods of implementation. In the EU, regulations are fully binding, directly applicable, and supreme over national law. Directives bind member states as to the result but require national transposition, while decisions bind their addressees, and soft law instruments have limited legal force.

Similarly, the AU distinguishes between regulations, directives, and non-binding instruments. However, although AU regulations are described as "binding and directly applicable", this does not confer genuine direct effect or supremacy. The AU lacks a supranational legal mechanism to ensure the automatic application or primacy of its law over domestic law.[82] The distinction in legal instruments reflects the broader institutional structures underpinning both organisations. The EU embodies a highly developed supranational legal order characterised by the direct effect and supremacy of Union law, allowing binding legal acts to take effect within member states without requiring national implementation. By contrast, the AU operates as a hybrid structure combining intergovernmental cooperation with only limited supranational features. Legislative competences at the continental level remain narrowly defined, member states retain primary authority, and the absence of legal supremacy means that national interests often prevail over continental commitments.[83]

79 See https://www.soils4africa-h2020.eu/the-project, accessed 4 July 2025.

80 See https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon, accessed 5 July 2025.

81 Adamu & Peter (2016).

82 Amani Africa (2022: 15–16); Mahlangu (2025: 3–5).

83 Adamu & Peter (2016: 52–55); Mahlangu (2025: 5–6).

4.3. Comparative analysis of institutional structures and legislative processes

While both the AU and the EU share certain structural features, including parliamentary, executive, and judicial bodies, significant differences remain in the degree of institutionalisation, the distribution of powers, and the procedures by which legal norms are adopted and applied. The EU is characterised by a highly institutionalised and supranational governance structure. The European Commission exercises the exclusive right of legislative initiative and oversees the implementation of EU law, while the European Parliament and the Council act as co-legislators under the ordinary legislative procedure. The Court of Justice of the EU ensures the uniform interpretation and application of EU law through binding judgments with direct effect.

By contrast, the AU operates predominantly on an intergovernmental basis. Ultimate decision-making authority rests with the Assembly, while the Pan-African Parliament has so far largely played an advisory role, lacking legislative competence, except for model law competence. The AU Commission does not enjoy supranational executive powers comparable to those of the European Commission, including the power of legislative initiative. The African Court's jurisdiction depends on the acceptance of individual member states, thereby limiting its authority and hindering the uniform application of its judgments.[84]

These institutional differences are reflected in the legislative processes. In the EU, the legislative process is highly structured and legally integrated.[85] The AU's legislative process is less developed than the EU's and relies heavily on intergovernmental consensus.[86] This consensus-based model contrasts sharply with the EU's decision-making dynamics. The AU's reliance on consensus slows the legislative process and gives informal power relations between member states significant influence over outcomes. By contrast, the EU employs more formalised voting mechanisms. In the Council, decisions are taken by qualified majority, while in the Parliament they are adopted by an absolute majority. This framework results in a faster and more structured legislative process that is less shaped by internal political balances.[87]

Policy network theory further highlights the institutional differences between the two organisations. The theory examines how various actors, such as government bodies, non-governmental organisations, multinational companies, and international institutions, interact in the policymaking process. In the EU, these networks are formalised and embedded in clear procedures. This structure increases transparency and enables non-state actors to participate meaningfully. In the AU, by contrast, such networks are

84 Baba & Mngomezulu (2021).
85 Greenwood & Roederer-Rynning (2018: 123–124).
86 Amani Africa (2022: 10–18).
87 Mahlangu (2025: 4–5).

less formal and less structured, reflecting the organisation's predominantly intergovernmental mode of governance.[88]

4.4. Comparative analysis of enforcement and implementation mechanisms

The AU demonstrates a comparatively limited capacity to implement its decisions. This is largely attributable to the predominantly non-binding nature of many of its legal and policy instruments. Even where binding instruments exist, their implementation is undermined by inadequate financial resources, weak institutional coordination, and limited administrative capacity. The AU continues to face significant financial, technical, and institutional constraints that hinder the effective implementation of continental instruments.[89]

By contrast, the EU operates within a highly developed implementation framework, characterised by clear legal obligations, detailed reporting requirements, and strict deadlines. These mechanisms ensure the consistent and effective application of Union law across member states. [90] Compliance cultures also differ. In the EU, comparatively high levels of compliance are sustained by institutional oversight, aligned domestic legal systems, economic incentives linked to the internal market, and peer pressure among member states.[91] In contrast, compliance within the AU is shaped more strongly by domestic political contexts and structural constraints.[92]

So far, the AU also lacks enforcement mechanisms comparable to those of the EU. Although continental institutions exist, their functional capacities remain limited, and the absence of an effective supranational adjudicatory mechanism restricts uniform application.[93] Overall, whereas the EU operates within a legally binding and institutionally robust system, the AU relies largely on non-binding instruments and faces significant structural challenges in ensuring consistent compliance.

Unlike the governments of European states, the governments of African states, when the AU was founded, pursued the goal of preserving their national sovereignty and did not transfer far-reaching powers to the AU. In the strict sense, the AU is not a supranational organisation like the EU, which has its own legislative, executive, and judicial powers within the framework of the powers conferred on it (principle of limited individual authorisation). The AU Assembly, as the highest decision-making body, has the power to define common policies, monitor their implementation, and impose sanctions on member states that fail to comply. Even the Pan-African Parliament, the

88 Ibid.: 3.
89 AUDA-NEPAD (2022: 3).
90 Mahlangu (2025: 6).
91 Ibid.: 5–6.
92 AU (2019: 57–77).
93 Mahlangu (2025: 6–7); Clarke et al. (2019: 1–2).

AU's (intended) legislative body, lacks legislative powers. In this capacity, it can only propose so-called model laws in areas assigned or approved by the AU Assembly. The adoption of these model laws by the AU Assembly does not directly create binding law applicable in the member states.

4.5. Comparative analysis of economic resources

The effectiveness of legal frameworks depends not only on institutional design but also on economic resources. Financial means are essential to translate legal commitments into concrete action, particularly in resource-intensive areas such as digitalisation and soil management.

The AU relies primarily on contributions from member states and external donor assistance. However, this funding model creates structural vulnerabilities. Persistent gaps between approved and actual expenditure reveal underlying structural weaknesses. Donor funding is often delayed or withheld, and its overall volume remains unpredictable from year to year. Member state contributions are frequently delayed, partial, or absent. This uneven contribution pattern creates uncertainty about the AU's financial base. As a result, the AU's capacity to achieve fiscal self-sufficiency remains severely constrained.[94]

These structural and financial constraints have direct implications for the AU's capacity to invest in and sustain key policy areas. One example is the digitalisation of agriculture, which requires substantial and stable funding.[95] Because the AU's own financial base remains limited and donor funding is often unpredictable, implementation will rely primarily on external partnerships and coordinated financing mechanisms.[96]

By contrast, the EU operates with a comparatively stable and autonomous financial framework. The EU budget is financed primarily through "own resources",[97] and EU programmes supporting digitalisation in agriculture and soil management, such as Horizon Europe,[98] are financed mainly from the EU budget rather than external donors. Overall, the EU's financial autonomy provides a more stable and predictable basis for regulatory action. In contrast, the AU's reliance on external donors and inconsistent contributions from member states limits its capacity to mobilise resources for effective implementation.

94 Pharatlhatlhe & Vanheukelom (2019: 1–8).
95 AU (2023a: 4–6).
96 Ibid.: 35–42.
97 Deutsche Bank (2020: 45–46 & 50–53).
98 See https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/programmes/horizon, accessed 5 July 2025.

4.6. Comparative analysis of sociocultural influences on policymaking

Sociocultural factors also shape policymaking in both organisations, particularly in areas such as digitalisation and soil governance. The African continent is characterised by significant cultural and linguistic diversity, which represents both an asset and a structural challenge. On the one hand, it constitutes a source of rich cultural heritage, knowledge systems, and local innovation that can inform inclusive policymaking. On the other hand, such heterogeneity complicates the development and implementation of coherent continental policies. Divergent languages, traditions, and governance practices often hinder effective coordination, resulting in policy fragmentation, uneven cooperation, and capacity disparities among member states.[99]

By contrast, the EU operates within a more structured multilingual framework. It has institutionalised multilingualism under the principle of "unity in diversity." All legal and policy documents are systematically translated into these languages to guarantee accessibility and uphold cultural and linguistic rights. While translation slows decision-making, the EU can manage this process because it deals with a limited number of languages and has a well-developed administrative apparatus to support multilingual translation.[100] By contrast, the AU faces far greater linguistic diversity and lacks comparable institutional capacity, making systematic translation much more difficult.[101]

Stakeholder participation constitutes another important dimension. Both organisations formally commit to involving civil society and affected groups in policymaking.[102] A further dimension relates to digital literacy, which plays a crucial role in shaping policy effectiveness. In the AU, low levels of digital literacy among small-scale farmers constitute a major obstacle to the uptake of digital technologies. Europe faces similar challenges: 44% of the EU population lacks basic digital skills.[103] However, in the African context, disparities in infrastructure, expertise, and capital risk exacerbate existing inequalities. Without targeted and inclusive policies, the digitalisation of agriculture may deepen socio-economic divides and exclude vulnerable groups, particularly smallholder farmers.[104]

99 Osemuyi (2024: 22–23).
100 Kuzelewska (2014: 151–152).
101 Ibid.: 161.
102 AU (2023a: 3 & 5); AU (2024b: 1-4 & 16); European Commission (2023: 14 & 43).
103 EIP-AGRI (2020: 3–4).
104 Kudama et al. (2021: 292–300).

5. Recommendations for the African Union

5.1. Legislative and policy development

5.1.1. Develop a binding continental legal framework

The AU, so far, relies on soft-law instruments, such as the Soil Initiative for Africa, which lack enforceability and legal certainty. Unlike the EU, whose supranational legal system enables binding measures with direct effect, the AU's predominantly intergovernmental structure limits its capacity to generate norms that prevail over national law. As a result, continental frameworks function mainly as political coordination tools rather than binding legal instruments. Establishing a binding continental legal framework would strengthen legal coherence, improve compliance, and provide a stable regulatory environment needed to integrate digital tools effectively into soil governance, objectives that soft law cannot achieve.

Insofar it is promising that the new Model Law on Soil Management in Africa offers a comprehensive framework to enable African nations to adapt and domesticate in their national contexts. Key provisions of the Model Law introduce forward-looking concepts, such as:

- Soil Impact Assessments – separating soil assessment from general environmental evaluations, ensuring soil health is independently measured in large-scale projects.
- Public Participation in Soil Governance – requiring that communities be involved in land use decisions before major agricultural or industrial activities commence.
- Zoning and Soil Use Planning – guiding countries on how to allocate land based on soil health and crop suitability.
- Digitalisation and Data Systems – establishing soil information systems to support scientific, data-driven decision-making.[105]

5.1.2. Integrate and align existing policy instruments

As proposed in the aforementioned Model Law, regulatory instruments, digitisation, agriculture and soil management instruments should be aligned with the law to ensure coherence and mutual reinforcement. In the EU, the Soil Strategy, the Soil Monitoring Law, and the AI Act are closely interlinked and embedded in broader frameworks, preventing regulatory fragmentation. So far, AU initiatives have operated in parallel

105 See https://spikedmedia.co.zw/pap-adoption-of-model-law-on-sustainable-soil-management-step-toward-food-security-and-climate-resilience/, accessed 1 March 2026.

without legal or institutional integration, limiting their effectiveness and creating gaps in governance. Yet legal integration is essential to enhance regulatory coherence and support the coordinated use of digital tools in soil governance. The Model Law on Soil Management in Africa could be a game-changer within the AU in this regard.

5.1.3. Establish clear regulatory objectives and technical standards

Clear regulatory objectives and harmonised technical standards are essential for providing legal certainty, ensuring consistent implementation, and preventing regulatory fragmentation. As illustrated by the EU AI Act, harmonised technical standards developed by European standardisation organisations play a central role in ensuring legal certainty and interoperability between different digital systems.[106] In the EU, the Soil Strategy and Soil Monitoring Law set clear goals, while the AI Act provides detailed rules for digital technologies. Although the AU has adopted various strategic objectives, these remain fragmented and lack harmonised legal standards. Establishing continent-wide objectives and binding technical standards would strengthen coordination and support the effective integration of digital tools into soil governance.

5.2. Institutional design and coordination

5.2.1. Strengthen AU-level legislative and oversight functions

In the EU, institutions such as the European Commission, the European Parliament, and the Court of Justice provide legislative initiative, democratic legitimacy, and judicial enforcement. The Court ensures the uniform application of EU law through binding decisions, while the Parliament exercises legislative powers on behalf of EU citizens. By contrast, the Pan-African Parliament lacks binding legislative authority, and the African Court of Justice is not yet functioning effectively as a supranational adjudicatory body. Strengthening AU-level legislative and oversight functions could provide the institutional foundation needed to achieve regulatory objectives and enhance compliance, coherence, and legitimacy at the continental level.

106 Art 40 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 Laying Down Harmonised Rules on Artificial Intelligence and Amending Regulations.

5.2.2. Enhance coordination between member states and Regional Economic Communities

Stronger coordination between member states and RECs is essential for strengthening continental governance. The RECs play a central role in translating AU norms into regional action. As legally recognised building blocks of the Union, they are required under the 2007 Protocol on Relations to harmonise their policies and treaties with those of the AU. Where coordination is weak, divergent legal standards and fragmented frameworks emerge, undermining legal consistency and effective implementation. Coordination among member states within the AU framework is equally important, as the Union's intergovernmental structure places primary responsibility for implementation on the states themselves. In the absence of supranational enforcement mechanisms, collective coordination is essential to ensure the uniform application of AU decisions. Where such coordination is weak, divergent national responses emerge, leading to fragmented implementation and undermining the Union's capacity to act coherently. In this regard, the Model Law on Soil Management represents a significant development within the AU.

5.2.3. Develop a centralised soil data platform

A centralised soil data platform is essential to ensure coordinated data collection, accessibility, and transparency at the continental level. In the EU, programmes such as Copernicus are embedded in a clear legal and institutional framework, enabling consistent monitoring and obligating member states to share data. The AU lacks a comparable system. Initiatives such as Soil4Africa attempt to fill this gap but lack a binding legal basis, and data remain fragmented and stored locally.[107] A continental legal instrument requiring data collection and sharing could strengthen coordination and support evidence-based soil governance.

5.3. Implementation, compliance, and enforcement

5.3.1. Define clear implementation procedures and timelines

Clear implementation procedures and timelines are crucial to translate legal commitments into concrete action. In the EU, instruments such as the Soil Strategy and the Soil Monitoring Law set clear objectives, structured timelines, and reporting obligations, allowing the European Commission to monitor progress and ensure consistent

107 See https://www.soils4africa-h2020.eu/the-project, accessed 4 July 2025.

application across member states. By contrast, AU frameworks outline broad policy objectives but lack binding procedures, timelines, or reporting mechanisms, which may lead to fragmented and delayed implementation and limit the effective integration of digital tools into soil governance.

5.3.2. Establish monitoring and enforcement mechanisms

Robust monitoring and enforcement mechanisms are essential to ensure compliance with continental obligations. In the EU, supranational bodies such as the European Commission and the Court of Justice monitor implementation and issue binding decisions to secure the uniform application of Union law. The African Court of Justice and Human Rights is envisaged as a continental adjudicatory body, but it is not yet fully operational. Existing enforcement mechanisms are predominantly of political and diplomatic nature. In the field of soil and digitalisation, weak enforcement could exacerbate fragmented data governance and hinder the effective use of digital tools. This institutional gap may weaken compliance and contribute to uneven implementation of continental soil and digitalisation initiatives across member states.

5.4. Develop stable and transparent funding mechanisms

Stable and transparent funding mechanisms are crucial to ensure the sustainability and effectiveness of a continental legal framework on soil and digital governance. These policy areas require long-term investments in digital infrastructure, coordinated data collection, and capacity building, which cannot be achieved through ad hoc, unpredictable funding.

Currently, AU initiatives in these fields depend heavily on fragmented and donor-driven financing, which limits long-term planning, undermines implementation, and weakens accountability mechanisms. A clear legal framework should, therefore, define how financial resources are secured, allocated, and monitored. This includes assessing internal funding options, identifying potential external donors and the conditions attached to their support, and creating incentives to attract private sector investment. Importantly, the AU should seek to strengthen its own financial base, drawing inspiration from the EU's use of internally generated resources to fund large-scale programmes. Reducing reliance on external donors could limit exposure to shifting priorities and conditionalities, while providing the financial certainty needed to build digital infrastructure, support coordinated data collection, and ensure effective implementation across member states.

5.5. Promote digital inclusion through culturally responsive and technologically adaptive frameworks

Future regulatory frameworks should take existing digital inequalities into account, particularly those between large and small farmers and between men and women. Significant disparities exist between large-scale and smallholder farmers; generally, male farmers have greater access to digital tools, while smallholder and female farmers face financial and educational barriers. Targeted training and subsidy schemes for smallholder farmers could help make digital tools more accessible.

Economic differences between AU member states may also be addressed, for example, through differentiated financial and technical support. Furthermore, regulatory frameworks could benefit from greater flexibility and cultural responsiveness. Setting overarching objectives at the AU level, while allowing member states to adapt implementation to local cultural contexts, may enhance both legitimacy and effectiveness. To address rapid technological developments, a risk-based approach, similar to that applied in the EU's AI framework, could be explored to maintain legal adaptability without frequent legislative changes.

6. Conclusion

> The speed of change is growing exponentially, and the new digital means, AI, are deemed to increase our power over nature. Humanity will need to develop an appropriate governance structure for these new technological capabilities, using the Sustainable Development Goals (SDGs) as a useful reference point. Encouraging research and development in sustainable digital technologies and developing appropriate new legal frameworks in parallel seem vital for leveraging the opportunities presented by the digital era. Such an approach is also necessary for using new digital means to improve sustainable soil management continuously.[108]

In this light, the article examined means of digital transformation and the extent to which the AU, inspired by the EU's example and adapted to Africa's institutional, cultural, and economic context, can develop, implement, and enforce a regulatory instrument governing the use of digital tools for more effective soil management and protection.

The analysis demonstrates that the AU currently lacks a comprehensive, binding legal framework to regulate the integration of digital tools into soil governance at the continental level. The newly adopted Model Law on Soil Management is expected to consolidate and streamline existing instruments, including the Soil Initiative for Africa and the Continental AI Strategy, to better recognise the importance of digitalisation. It will also contribute to improved implementation and enforcement mechanisms once domesticated in the AU member states. While structural constraints, including financial dependence on external donors, limited administrative capacity, and the absence

108 Ginzky & Ruppel (2025a: 249–269, 267f).

of supranational legal supremacy, restrict the uniform application of continental norms, the effectiveness of the Model Law will depend on sustained political commitment, institutional strengthening, and stable financing mechanisms at both continental and national levels.

By contrast, the EU operates within a binding and institutionally embedded legal order. Instruments such as the EU Soil Strategy for 2030, the Soil Monitoring and Resilience Directive, and the EU AI Act illustrate how soil governance and digitalisation can be integrated within a structured legal and institutional framework supported by monitoring, reporting, and enforcement mechanisms.

However, the comparative analysis also shows that the European model cannot simply be replicated. Differences in institutional design, levels of integration, financial resources, and socio-economic conditions require context-specific adaptation. The EU experience, therefore, functions as a source of inspiration rather than a template.

As such, the Model Law on Soil Management in Africa comes at a timely moment, offering principles, definitions, institutional designs, and implementation pathways that are adaptable to diverse legal systems of the African continent. Synergies are particularly promising with the EU Soil Monitoring and Resilience Directive, where knowledge exchange on monitoring, data governance, and science-policy interfaces could accelerate progress on both continents through shared research, interoperable datasets, and coordinated capacity-building.[109] For decades, the international plane treated soil as an afterthought, referenced tangentially but rarely the subject of direct obligations. The task before international law, policy, and governance is no longer to justify soil's inclusion but to ultimately build the forum and establish the framework that the planet requires.[110]

While the legal comparability between the two Unions remains asymmetric, the EU Soil Monitoring and Resilience Directive and the Model Law on Soil Management in Africa are evolving soil frameworks that can accelerate progress towards improved digital transformation, soil protection, and monitoring on both continents. While at the international level there may still be a long way to go, at the regional and continental levels, within the AU and the EU, the most recent legislative developments described in this article are promising steps toward improved soil governance.[111]

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109 See https://spikedmedia.co.zw/pap-adoption-of-model-law-on-sustainable-soil-management-step-toward-food-security-and-climate-resilience/, accessed 1 March 2026.

110 Ruppel & Murray (2025: 15).

111 These legislative efforts are also in line with the joint declaration that emerged from AU–EU Parliamentary Pre-Summit Meeting, held in Midrand, South Africa on 14-15 November 2025. Therein the Pan-African Parliament (PAP) and the European Parliament (EP) have issued a Joint Declaration under the theme "Renewing Africa-Europe Parliamentary Cooperation in a Changing Global Context". It therein reflected on the 25th anniversary of the formal AU–EU Partnership, which provides a timely opportunity to take stock of progress, identify gaps, and shape a future-oriented partnership anchored in the UN 2030 Agenda for Sustainable Development and AU Agenda 2063. Moreover, the declaration reflects the ambition to renew the "commitment to multilateralism, international cooperation and parliamentary diplomacy founded on the principles of the UN Charter, the

Sustainable Development Goals and the Africa's Agenda 2063 as a means to resolve the complex political, security and socio-economic challenges facing our continents and to promote human rights, democracy, good governance, the rule of law, peace and security." It further expresses the joint commitment "to promote the strengthening of global health, sustainable international agri-food systems, climate resilience." The declaration even calls "for the institutionalization of the parliamentary dimension to make it an integral component of the AU-EU institutional framework", cf. https://pap.au.int/en/documents/2025-11-24/joint-declaration-following-au-eu-parliamentary-pre-summit-meeting, accessed 13 March 2026.