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I.1. SUSTAINABLE DEVELOPMENT AND ARTIFICIAL INTELLIGENCE: IS AI4ESG A KEY DRIVER TO REACH THE OBJECTIVES OF UN AGENDA 2030?

Artificial intelligence towards sustainability in the global setting

Innovations are deceptively difficult answers to sustainability questions. Closely linked to the roots of the global sustainability crisis, they are also envisaged as sustainable development goals (SDGs) of the United Nations (UN). Uniform regulation of innovations and the compliance of stakeholders is crucial for this purpose. Here, the most influential state and non-state actors are the best target audience – they generate the largest impact on sustainability issues, and they have developed the most powerful innovative technologies. Sustainability standards built into their value chains, individually measured, and boosted with efficient enforcement are expected to accelerate necessary changes.

Not surprisingly, big data is related to sustainability targets, a variety of sustainability frameworks, and the global nature of sustainability. With the development of artificial intelligence (AI) technologies, essential challenges posed by big data – volume, velocity, and variety, now usually referred to as the 3 Vs of big data – are dealt with by artificial intelligence with surprising speed and efficiency. AI is deemed to help achieve the objectives of the 2030 UN Agenda for Sustainable Development (Resolution A/RES/70/1 2015) nearly perfectly: almost half of the UN social development goals and 4 of their 5 targets are estimated to attain accelerated progress via the use of AI (Sætra 2015, p. 7). In the future, AI may facilitate the emergence of new ESG (environmental, social, and governance) targets and new goals (such as the right to the internet). In the meantime, AI-based solutions developed specifically for ESG (often referred to as AI4ESG) are already in the market. Expectations that AI will automate ESG compliance at no cost are on the rise. At first sight, the actual impact of AI on human rights and the environment (Wynsberghe 2021, p. 1) seems to be well covered by the proposed legislation on AI. However, the pace of AI-driven sustainability is slow. Barriers to the operationalization of sustainability are explained by various reasons, including lack of competence and lack of incentives for businesses (Tse 2020, p. 21).

The acceleration of the achievement of sustainability goals with the help of artificial intelligence systems

The SDGs are a set of political objectives encompassed in the UN Agenda 2030 for Sustainable Development. Despite having the form of "soft law," they are described as revealing a subset of existing intergovernmental commitments, serving as a reflection of the fragmented nature of international law (Kim 2016, p. 16). The importance of sustainability objectives is undeniable. It is sometimes claimed that states have an *erga omnes* obligation to mitigate and manage climate change (Sciaccaluga 2020), or that environmental protection represents the early emergence of a jus cogens principle (Alarcon 2021).

AI as a new technology does not disrupt international human rights laws as a framework per se, only creates the necessity to reinvigorate and reinterpret them (Zamfir 2022, p. 3). The deployment of artificial intelligence for sustainable development requires a precautionary approach: first, states are required to refrain from taking actions that will result in human rights violations; and second, they must adhere to the duty to protect from arbitrary rights interference (Murray 2020, pp. 158–162).

The importance of sustainability may indicate a pressing need to use the best possible measures at states' disposal. Current data shows that developed states demonstrate the best sustainability results; they can efficiently use their potential in limiting conditions (Grochová & Litzman 2021, p. 718). However, if all states continue with their current strategies, only five of them are expected to reach the Agenda 2030 goals on-time (p. 709). Stronger efficiency is needed in this regard. AI deployed for automating human work perfectly fits this purpose and facilitates good governance. AI may support the core of good governance by performing tasks of detection, prediction, and data-driven decision-making (Margetts 2022, p. 361).

The feasibility of artificial intelligence solutions for sustainability (AI4ESG)

AI requires large and varied datasets of information to produce the best results. High-quality data is crucial for measuring, rethinking, and improving sustainability.

The public sector owns a unique data pool that is extremely valuable for ESG compliance as it collects, produces, reproduces, and disseminates a wide range of information in many areas of activity. In parallel, companies, media, and individuals generate a vast amount of digital data daily; in estimation, only 0.007% of the world's information is on paper now (Herbert & López 2011, p. 332). Despite the maturity of a data-driven society and the presence of AI4ESG solutions, the "triple bottom line" (business' care for profit, people, and the planet) is not a mainstream practice among companies (Tse 2021). That, in turn, poses a question: what underlying issues may be hindering the implementation of UN Agenda 2030?

The first problem stems from the uneven development of the technological environment, as only slightly over 60% of the global population has access to the internet in 2022 (International Telecommunication Union 2020). The AI-powered world cannot exist without first resolving the

issues of digitization, digital literacy, advanced infrastructure, and the ecosystem of innovators in developing countries (Francesc *et al.* 2019, p. 1). AI may be used universally for the reasons of ESG compliance, with the condition of the equal footing of states. However, the priority of the empowerment of AI over other pressing needs of developing countries is unsettled in Agenda 2030. As a result, the granularity of sustainability actions and results is unavoidable, giving a first-mover advantage to developed states.

There is a second related challenge: uneven development of the regulatory landscape. Regulation of AI, open data, and big data is not well-established, consistent, or stable. AI-related normative initiatives are emerging in only half of the independent states (OECD [Organization for Economic Co-operation and Development] 2021). No global regulatory framework is present. Regulation, when existent, varies in purpose, scope, policy choices, and enforcement from state to state. Regarding this, the OECD (2019) calls for a more sustainable, long-term approach, requiring a proper governance framework, competence, high-level political commitment, and the recognition of the crucial role of the data ecosystem. In this context, AI4ESG is directly dependent on the particularities of different AI and data access regimes and the flow of data. The dynamics of regulatory initiatives may push the market towards reduced or uneven use of AI4ESG, fostering further imbalance between developed and developing states.

Consequently, a lack of internal synergy is noted across all regulatory policies concerning sustainability, AI, open data, big data, and related areas. Regulatory initiatives for open data do not line up and concentrate at two poles: widening the scope of exclusive rights towards data, and facilitating data availability and access (Martens 2018, p. 20). The extensive space between these opposites leads to self-regulation, where codes of conduct and bilateral agreements on data access shape the rules and create a grey zone for the "open washing" of governments. A similar trend containing conceptual gaps is noted in sustainability at the company level. A universal sustainability standard is not set. Instead, there are many, among which four are distinguished as the most significant: the UN SDGs, the Global Reporting Initiative Standards, the Task Force on Climate-Related Financial Disclosures, and the Sustainability Accounting Board Standards. A variety of sustainability frameworks and standards, a so-called "alphabet soup," establishes different benchmarks. In such circumstances, AI technology is not efficient enough to provide global comparability of ESG progress in states, with new side-effects such as ignoring "greenwashing."

At this point, the problem of imbalance due to dual standards may occur. For instance, it is suggested that the European Union (EU) is willing to adhere to minimum ESG standards when concluding international agreements with third states. At the same time, the EU sets higher ESG standards for companies in the internal market (Bronckers 2022). The justification of different standards can be explained, inter alia, by responsibility for non-conformance. The responsibility of states does not require fault (the violation of an international obligation and the attribution requirement is necessary), while fault-based liability is usually preferred in the case of companies. However, as Gentian Zyberi noted, "due diligence standard requires States to set their national climate mitigation targets at the level of their highest possible ambition and to pursue effective domestic mitigation measures to achieve those targets" (Feria-Tinta 2022). The non-uniform drafting of sustainability clauses and dual standards may end in inconsistent results of AI4ESG, may contradict legal certainty, and may raise the question of unfair treatment. Broad

sustainability goals with loose enforcement clauses in interstate treaties may indicate a declarative value of sustainability.

There is no hierarchy among UN SDGs: on the contrary, goal indivisibility and integration are emphasized in Agenda 2030. However, they are regularly criticized for lacking coherence (Kim 2016, p. 16). A trend that some goals are more important for states is confirmed in a real-world setting. Countries' priorities from 4 years of reporting show that SDG 17 on global partnership and SDG 13 on climate change have received the most attention, while SDG 10 on inequality has received the least (UN Committee for Development Policy 2019).

Due to the nature of machine learning, AI4ESG is capable of reinforcing this trend of disparity. Even if the capabilities of AI to train on any data – whether environmental, social, or governance – are the same, the quality of data is different in various sectors. Environmental data, such as waste, transport, energy consumption, and others, are typically numerical. Social and governance data may come from unstructured texts that are complicated, but that are reduced to "yes" or "no" decisions. In other words, environmental AI produces *quantified values*, and social and governance AI produces *approximations*, with a vague margin between true and false.

It is argued that when SDGs are implemented individually, they pose the risk of unintended consequences (Griggs *et al.* 2014, p. 49). When states lack a determinate rulebook to balance different SDGs, so does an artificial intelligence system, which might favor recurring state behavior over declared values. The usage of AI may then affect the rights of vulnerable groups by, for example, creating the aura of a falsely good stance on human rights. No technology, including AI, should lower the current protection of human rights, so additional safeguards must be implemented for the proper functioning of social and corporate governance-related AI systems. The individual human review of AI-generated results is necessary, as well as impact assessments that check for compatibility and compliance with human rights standards.

Artificial intelligence towards sustainability in the European Union setting

Sustainability as a competitive advantage of the European Union

It seems that the variety of ESG standards and the horizontal alignment of legislation all over the world does not help much in contributing to the achievement on time of the sustainability objectives set in Agenda 2030. As one of the major legislators, however, the EU has the privilege of applying a top-to-bottom approach to Member States and demonstrates ambitious plans to set global standards of sustainability. The feasibility of these plans depends, among other things, on the internal coherence of EU legislation.

After a long history of non-interventionism (Conac 2022), the European Commission (EC) has launched solid interrelated regulatory initiatives to address emerging global challenges. One of them is the 2019 European Green Deal (EC Communication COM/2019/640), a new growth strategy that aims to transform the EU's economy into a sustainable one and to turn climate and environ-

mental challenges into opportunities across all policy areas within 30 years. This strategy includes plans to roll out re-usable data services to assist with large volumes of data relevant for compliance, establish data space for smart supply chain applications, develop digital product passports and map resources, track waste shipments, and so on (EC Communication COM(2020)66).

Another initiative is Europe's Digital Decade, launched in 2020. Europe's Digital Decade 2030 aims to empower businesses and people towards a human-centric, sustainable, and more prosperous digital future. One of the targets includes the aim of having 75% of EU companies using Cloud/AI/Big Data. Digital regulation packages have an objective to "provide Europe with a leading role in setting the global gold standard" (EC 2022).

Does the EU Commission understand sustainability as a long-term goal of the global competitiveness of the EU? It would seem so. After Brexit, the EC has been introducing ambitious changes that might earlier have been opposed by the United Kingdom. The temporary inactivity of the United States presented a chance to be the first in setting "Sustainability in the European way" as global compliance standards (Conac 2022). However, did the EU prepare adequately in terms of making sustainability compliance actionable and not only existent on paper? Are regulatory initiatives consistent and realistic enough to produce the expected results?

The following major regulation packages and proposals, and others, must be coherent: the Artificial Intelligence Act (EC Proposal COM/2021/206, hereinafter also referred to as AI Act); the Artificial Intelligence Liability Directive (EC Proposal 2022/0303(COD), hereinafter also referred to as AI liability Directive); the Corporate Sustainability Due Diligence Directive (EC Proposal COM/2022/71, hereinafter also referred to as CSDD); the Corporate Sustainability Reporting Directive (EC Proposal COM/2021/189, hereinafter also referred to as CSRD); the Revised Product Liability Directive (EC Proposal COM(2022)495); the Data Governance Act (EC Proposal COM(2020)767); the Digital Markets Act (Regulation 2022/1925); and the Digital Services Act (Regulation 2022/2065). Member States must be in consensus regarding them all, as a missing link may make the situation worse than it was before regulation.

One thing is clear: unified sustainability standards and streamlined and harmonized legislation are necessary for unleashing the full potential of artificial intelligence for the ESG. Attempts to introduce standards of such quality in Europe exist. The European Sustainability Reporting Standards (ESRS) distinguish themselves in terms of their target audience, priorities, enforcement, and dual disclosure requirements. EU sustainability standards are built on EU legislation, its sustainability taxonomy, and investor disclosure agreements, while international sustainability standards (as of the International Sustainability Standards Board, or ISSB) point to all jurisdictions and are voluntary (Howitt 2022). The EU sustainability standards set in the EU Corporate Sustainability Reporting Directive are criticized for their insufficient alignment with existing due diligence standards (such as the OECD-UNGP Impact Standards for Financing Sustainable Development) (Stibbe 2022). The mapping process of EU sustainability standards with alternatives (GRI, TFCD, and others), i.e., establishing convergence, has already begun (Howitt 2022). The contextualization of standards and the communication lines between them is necessary for better comparability of ESG results and efficient AI usage.

Alternatively, EU sustainability standards may be exported outside the EU market and become global. The extra-territorial application of newly introduced EU legislation, sometimes referred to

as the "Brussels effect," backs this idea. Nonetheless, corporate sustainability governance proposed by the EU imposes stricter standards than elsewhere. This governance also does not stem from the practice of EU Member States. It is argued that it may not be easy to repeat the success story of GDPR when private entities have the option of jurisdiction shopping (Conac 2022). However, legal certainty due to clear rules and lower competition in the EU market may outweigh the expected burden of compliance.

The sustainable adoption of artificial intelligence in the European Union

The largest jurisdictions, with the EU and China leading the way, draft rules to address regulatory issues of AI. Attitudes to AI are different and are based on regional values and objectives. EU regulation dedicated to protecting human rights is based on precaution and prevention: it ascribes risk levels to AI systems, requires pre-market assessment for high-risk AI systems, and expands the functions of oversight and supervision. China follows a different ideology and targets *BigTech* market regulation (Edwards 2022, p. 6). The notification of AI being used in interactions with humans is necessary, especially for AI recommendation systems that impact user opinion. However, AI-related risks are to be resolved after product release, not before it. This technical approach favors the quick development of technology but also means that AI experiments with real users at their own risk (Keane 2022).

The EU AI Act is criticized by businesses for not being innovation-friendly enough (Bertuzzi 2021), for the unrealistic expectation that AI systems will be error-free, and for its vague legal obligations (Bertuzzi 2021). Generally, innovation-friendliness, as seen from the example of China's approach, is often achieved on the account of human rights. Staying within the current regulatory vacuum (that is very innovation-friendly) was not an option for the EC, and artificial intelligence became too important to ignore. Adopting stringent AI rules and closing the European market was not an option either. A logical step was to select the least intervening approach, with mandatory rules in areas where feasible and appropriate, that pays attention to some of the particularities of the industry.

AI systems may raise a variety of ethical and legal challenges. The risk-based regulatory approach in the EU AI Act supports different risk levels of AI systems, ranging from minimal to unacceptable risk. It is estimated that 5%–15% of AI systems within the EU would be categorized as high risk and bear the cost of compliance, starting from €30,000 (Johnson 2021). Most AI systems pose minimal risks (for example, those intended to find grammar errors in documents or optimize resources).

The scope of unacceptable and high-risk AI systems is disputed as too narrow, thus posing threats to the protection of fundamental human rights. Suggestions from non-governmental organizations include the prohibition of: all social scoring systems; all remote biometric identification in publicly accessible spaces; all emotion recognition systems; all discriminatory biometric categorization; all AI physiognomy; all systems used to predict future criminal activity; and all systems to profile and risk-assess in a migration context (Lomas 2021).

Unacceptable and high-risk AI lists did not emerge without the consideration of AI's impact on human rights and its effect on global competition. The EC drew up lists of unacceptable risk

and high-risk AI systems based on impact assessments. Unacceptable risk, as noted in AI Act, is related to grave contraventions of EU values and fundamental rights and freedoms. High risk is described as having a significant harmful impact on the health and safety or fundamental rights of persons in the EU that has materialized or is likely to materialize in the near future, when such a limitation will minimize any potential restriction on international trade.

Likelihood of risk and impact, balance tests, and other uses of AI systems are important when deciding if a certain AI system should be classified as "unacceptable" or "high risk." For now, it seems that the post-ante evaluation of risks, or learning from mistakes, is preferred over the theoretical consideration of potential risks. The suggestions of civil society, presented above, may materialize in case of the occurrence of very likely and significant harm in some AI systems. After the adoption of the AI Act, ex-ante assessments of the impact on human rights would play a greater role. Transparency duty – the obligation to publish annual impact assessments of high-risk systems – would complement the accountability of AI providers or AI users and legal certainty within the EU.

There are more vague spots in the EU AI regulation that are not aligned with sustainable development and may act as barriers.

The scope of AI regulation directly depends on the choice of how broadly or narrowly AI is defined. The EU AI Act expands the OECD concept of an AI system (OECD Recommendation C(2019)34 2019) and defines it as "software that is developed with one or more of the techniques and approaches listed in Annex I and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions influencing the environments they interact with." Differing from the OECD definition, an AI system is defined as software and not a system. Accordingly, the AI system covers situations where it is a component of another product. Software is to be delineated from related infrastructure, thus shrinking the scope of liability. The list of appropriate techniques and approaches in Annex 1 is broad. For example, the inclusion of statistical approaches to the concept allows it to grasp the experimental trials of AI beginners, but also blurs the line between algorithms and statistics. A rather broad scope of AI implies a dissonance between slow amendment procedures in the EU and the fast development of technology.

Speaking about requirements for data, in Article 10(2(e)) the AI Act demands that "training, validation and testing datasets shall be relevant, representative, free of errors and complete" in high-risk AI systems. Systemic reading of the AI act shows that some actions to satisfy the requirements set in Article 10(2(e)) are provided (routine audits, checks, etc.). There is no legal certainty, though, that all necessary measures for data quality are listed. To make things more complicated, open-ended terms are used ("appropriate data governance and management practices").

Following a formalistic attitude, these requirements for datasets are impossible to meet in a real-life setting, as an error in data is also data in a technical sense. Paired with AI liability rules, these requirements are not feasible. Textual data may be error-free but have hidden discriminatory practices that will become visible later, after a series of updates and improvements. The application of AI is a chain of experiments until the best match of the model is found. "Estimated quantity" is of indefinite value ("a prior assessment of the availability, *quantity*, and suitability of the data sets that are needed") (Liza 2022, p. 7). Some claim that "statistical, mathematical, and computational learning theory is not advanced enough to give evaluation metrics for those criteria" (Liza 2022, p. 7). Pro-

cedures to ensure the following quality and mitigate risks are crucial to the idea of trustworthy and explainable AI, but they cannot guarantee zero-error situations in the real world. The chance of error in AI systems resembles rare side-effects of medicine, but it is even more likely due to the unpredictability of machine learning. Therefore, guidelines on applicable technical standards, explanatory memoranda, and methodologies are essential before the AI Act enters into force, as high-risk AI systems require pre-market assessment.

Legal obligations fall on all AI system operators: providers, users, importers, and distributors. The way that they are set resonates with a vertical product safety regime, i.e., a scheme that doubtfully fits a complex AI environment (Edwards 2022, p. 7). Interaction between the duties of high-risk AI system providers and AI users is most important. In some cases, the AI user is converted into an AI provider. For example, general-purpose AI, like GPT-3, falls into the category of regular AI, but its user applications may fall into the category of high-risk AI, depending on specific use. Alternatively, when users modify the AI system, they are converted to providers and bear the responsibility for the modified version.

Both AI providers and users are assumed to act professionally and have due diligence duties. The provider (the developer or owner of the AI system) and the AI user share the responsibility for AI performance to different degrees. One of the duties set in Art. 29 of the AI Act requires AI users to monitor the operation of the high-risk AI system based on instructions for use. If AI users suspect risks, they must inform the AI provider or distributor and suspend the use of the system. AI liability on the provider is disputable in this case, as the provider does not have access to the operational data of the user. Due diligence if multiple parties are involved, such as in the case of third parties' datasets or open-source AI systems, is complicated.

The obligations of the end-users of the system are not regulated by the AI Act: if their behavior using the AI system violates human rights, it is subject to other laws. The motive not to re-invent existing legal rules is justified, but the effect of AI on morphing human behavior is overlooked. For example, consider a case of algorithmic pricing. An AI system routinely makes suggestions to raise prices for tenants instead of suggesting the option of higher occupancy. Most of these suggestions are accepted by end-users (landlords) (Cassin 2022). Here, several legal issues raise concerns. First, a recurring habit to rely on machine suggestions is formed, with AI below the threshold of manipulation or subliminal techniques. Second, suggestions are based on confidential price-sharing information, so shaping a group's behavior may amount to cartel behavior (Cassin 2022). Third, even if the decision to raise the price is being made by a human, not an AI, questions such as "what is the decision?" "was it independent?" and "is it ethical to influence such decisions?" remain unresolved, along with liability issues.

The "Black box effect," or AI opacity, is minimized by the transparency duties of high-risk AI providers. Under Art. 13, transparency "by design and default" of AI systems is required: users can interpret the system's output and use it appropriately. Second, instructions given to users must, inter alia, specify known or foreseeable risks, covering "reasonably foreseeable misuse." Third, the AI Liability Directive (Proposal 2022/0303(COD)) establishes a disclosure duty for providers, where disclosed information includes datasets, technical documentation, logs, records of the quality management system and so on. Failing to provide information implies the fault of the provider. Fourth, during (potential) litigation, a claimant may request such information, and circumvent the "black

box effect" because the rebuttable presumption of causality requires basic facts to be proved. Under the AI liability directive, it is not necessary to prove fault if: the AI system's output or failure was reasonably likely to have caused the damage; that damage or harm was caused by some human conduct influencing the AI system's output; and the conduct did not meet a duty of care under EU or national law that was directly intended to protect against the damage that occurred (Gesser *et al.* 2022).

In the long run, it might be necessary to elaborate or expand on transparency measures. For example, it is now unclear what falls within the scope of "reasonably foreseeable misuse" or "reasonably likely" causal link, or "appropriate human-machine interface" for human oversight in a tech environment. Is such reasonability or foreseeability characteristic of an average AI user (that may switch roles to become a provider if they substantially alter the AI system)? How professional should natural persons dedicated to human oversight (Art. 14) be – is a baseline competence to identify the main limitations and shortcomings under the requirements of Art. 14 satisfactory? Would it be a good idea to borrow the concept of the average consumer from consumer law? Within the meaning of the AI act, the user is defined not as a regular end-user of the AI system, but as a natural or legal person, public authority, agency, or other body under *whose authority* the AI system is operated, except where use occurs during a *personal non-professional activity*. In the AI liability directive, the related concept of an injured person or claimant, but not an AI system user, better matches the concept of "average consumer."

Under Art. 12 of the AI Act, record-keeping is required to ensure a level of traceability of the AI system's functioning throughout its lifecycle that is appropriate for the intended purpose of the system. Limits for the record-keeping of technical documentation are set to 10 years after the AI system was launched in the market. It is required, among other things, to log operations and events, input data, and the identification of persons that verified the result. In practice, this means the unsustainable practice of storing vast amounts of data and a potential conflict with GDPR provisions (in the sense of duration and personal data categories). On the one hand, a flexible approach regarding duration is more fit for various applications of AI. However, it also opens the gates to storing data longer than is necessary in terms of GDPR (the effect of the AI Act complementing GDPR is envisioned in the preamble) and influences sustainability (the storage of records in data centers). The dilemma of privacy vs. AI explainability would arise in the case of a federated AI, which is based on learning from small-sized decentralized data and does not log it.

The sustainability of the adoption of artificial intelligence also requires an appropriate balance between the ex-ante and ex-post compliance measures of supervisory authorities, as well as ongoing compliance checks (as AI systems may evolve). A focus on the guided implementation of requirements for AI systems and soft law (such as technical guidelines, consultations, and recommendations) would prevent potential infringements of regulation and minimize the necessity for complicated ex-post enforcement.

To sum up, diverse standards for artificial intelligence systems may create a global dichotomy between trustworthy and dangerous technologies. The artificial intelligence framework in the EU provides balanced rules for AI technologies and could set a good example for others. The general value of these rules should not be denied based on the critical remarks that they have received. The regulation of such an extremely complicated area as artificial intelligence is inevitably associated

with further clarification, reassurance, and amendments. The protection of human rights may be improved by revising lists of banned and high-risk AI practices. This innovation ecosystem would enjoy more favorable conditions and would thrive in the EU if overlooked technological complexities were duly addressed. Both citizens and businesses would benefit from clear rules on unacceptable risks, transparency, and risk management in high-risk AI systems, which would entail a liberal view of the development of regular AI systems.

Are large corporations able to push the objectives of sustainable development out of stagnation?

Peter Drucker once wrote that culture eats strategy for breakfast. Corporations may assist states in accelerating sustainable development if they become major stakeholders in the compliance process. The scope of compliance and enforcement measures, especially penalties, motivates businesses to commence sustainable changes.

The scope of obliged entities is different in the legislative instruments of corporate social responsibility and artificial intelligence. It is characteristic that the largest segments (not all) are targeted towards having the highest impact. As for artificial intelligence, due to its extraterritorial application (GDPR-like), non-EU companies are also targeted. Having in mind that only 4 European companies feature in the top 100 AI startup locations (Ipek 2022), the effect of this would be mostly non-European. The potential effect of the AI Act depends on how global European AI standards will become, and how appealing the EU market is for non-EU companies.

The proposal for corporate sustainability due diligence was criticized for covering only large companies, fearing that the non-inclusion of listed and high-risk SMEs will have too little impact on sustainability objectives (Stibbe 2022). In the Commission's estimation, 13,000 EU companies (1%) and 4,000 non-EU companies will now fall under its scope. This includes companies with >500 employees on average and with a net worldwide turnover of more than €150 million in the last year, or companies in the high-risk sector with more than 250 employees on average and a net worldwide turnover of more than €40 million, provided that half of their turnover stems from the high-risk sector. For non-EU companies, only the turnover in the EU criterium is applied.

Companies must take care of sustainability compliance within their value chain, which includes not only subsidiaries but also contractors with whom an established business relationship exists. The scope of this is very wide, since it covers indirect business relationships with proof or the expectation of their lasting nature. Therefore, it seems that a considerable proportion of businesses will be covered, with large corporations acting as internal supervisors for companies within their value chain.

Under the requirements of the proposed EU Corporate Sustainability Reporting Directive (EC Proposal COM/2021/189), large companies would need to publicly disclose information on the way they function and manage social and environmental risks. They would also be responsible for evaluating information from their subsidiaries. The scope of this has been expanded more than four times, with 50,000 companies to be directly subject to reporting on sustainability issues. This scope includes all large companies, whether they are listed or not, and listed SMEs. In addition to

this, CSRD disclosure rules may be applied to non-EU companies that have securities listed on the EU market.

The deterrent effect of sanctions for non-compliance is high. The EU is not exceptional in this area – for example, penalties for the violation of China's Personal information protection law can amount to up to 5% of total revenue (Yin *et al.* 2022). Sanctions for the violation of the AI Act are higher than those of the GDPR, but are similar to those of the Digital Services Act. The maximum fine is €30 million, or, in the case of companies, up to 6% of total worldwide annual turnover, whichever is higher. However, compared to sanctions for the violation of the Digital Markets Act, which regulates large actors in the same digital business but is related to competition law, they look moderate: for the latter, these sanctions can amount to up to 10% of the company's total worldwide annual turnover, or 20% in the event of repeated infringements, and periodic penalty payments of up to 5% of the company's total worldwide daily turnover. Private enforcement (civil liability) supplements the prevention of violations. In the Proposal for product liability directive (liability for defective AI products), the lower threshold and upper ceiling for compensation are removed.

The enforcement of sustainability due diligence obligations is focused on two pillars: public enforcement by regular administrative supervision (and sanctions regulated by the national law of Member States), and private enforcement with civil (fault) liability (or compensation for damages). Fines are based on the company's turnover, with a requirement to be effective, persuasive, and proportionate. Non-compliance with directors' sustainability duty of care is not within the scope of the directive. The burden of proof is also missing in the regulation, and is estimated to be crucial for the efficient application of legal requirements.

The legislative initiatives of sustainability and digital compliance in the EU demonstrate that the scope of obliged entities is to be significantly increased. This scope is not limited to EU-established entities, with a clear strategy to set global standards of compliance. Sanctions for non-compliance with artificial intelligence requirements (and other digital business) are clearly defined and raise the bar in relation to the GDPR. The enforcement of sustainability due diligence and reporting obligations, however, does not go so far. A strategy of tightening compliance in the sectors where large corporations operate may prove to be more efficient than seeking a consensus on sustainability across Member States.

Conclusions

States act much slower than planned to achieve SDGs: if they continue with current practices, sustainable progress will be delayed. AI can contribute to the acceleration of achieving SDGs on time. The feasibility and scope of the positive impact of AI for sustainable development largely depend on the consistency and integrity of the regulatory framework. Systemic flaws and major regulatory barriers to the sustainable adoption of AI must be identified and duly addressed.

A fragmented approach to sustainability frameworks and standards, uneven state development and priorities, and a lack of global rules regarding sustainability and AI inhibit the potential of AI to be unleashed for this purpose. Global efforts towards sustainability are at risk of not producing a meaningful impact on the objectives set out in the UN Agenda 2030.

The EU may become the world's flagbearer in sustainability, globalizing European standards on compliance and artificial intelligence. The standards of artificial intelligence need some elaboration regarding the better protection of individuals and clarification of the status of AI providers and users. These standards are nevertheless best-in-class regarding their balance with the protection of fundamental human rights.

Different standards for AI systems may create a global dichotomy between trustworthy and dangerous technologies. Large corporations, as targets in the major regulatory initiatives of the EU, may assist in mitigating this risk by becoming compliance stakeholders in sustainability and interrelated initiatives.

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