CHAPTER 14

The Fallacy of Disruptive Technologies and the Primacy of Politics

Sustainable Development Goals as an Example

Imad Antoine Ibrahim

CONTENTS

14.1 INTRODUCTION

Over the last decade, new technologies have emerged affecting the implementation of the United Nations (UN) Sustainable Development Goals (SDGs). These include Artificial Intelligence (AI), Big Data Analytics, Blockchain, Internet of Things, next-generation robotics, digital agriculture, gene editing, the microbiome, and additive manufacturing, among others (Bringing Ingenuity to Life, n.d). Through them, the international community hopes to ensure the realization of the 17 aims in the areas of science, technology, and innovation (Doyle, 2021; Mohieldin, 2018). Examples include SDG 2 "Zero Hunger", SDG 3 "Good Health and Well-being", SDG 6 "Clean Water and Sanitation for all",

DOI: 10.1201/9781003325086-14

SDG 12 "Responsible Consumption and Production", SDG 16 "Peace, Justice and Strong Institutions", and SDG 17 "Partnerships for the Goals" (UN DESA, n.d.).

Disruptive technologies are game changers in the field of sustainability and all existing sectors as they highlight a paradigm shift in governance (Sousa et al., 2020). This notion is considered part of the theory of "disruptive innovation" established by Christensen in the 1990s. It describes new technologies that can affect and change business models and enable the creation of new markets (Ibrahim et al., 2022). Disruption in this case refers to a variation that leads to the inefficiency of products, services, and processes. This may take place as new technologies cost less, are of a better quality, alter a consumer's behavior, and there may, correspondingly, be new regulations and resource scarcity. Disruptive innovation refers to the introduction of commercial products or services that affect the operations of existing players at various levels, such as industry segments and structures, and the social system. Disruptive technology has the potential of creating disruptive innovation (Millar et al., 2018). The assumption in the literature is that such technologies will significantly improve governance when it comes to sustainable development (Akkucuk, 2021). There is an atmosphere of hope and optimism that has begun resulting in international organizations and states riding the disruptive technology wave (ECOSOC, 2019). Nonetheless, technological progress, if left unchecked, can negatively impact the achievement of the SDGs given the role of Big Tech and the need to regulate an emerging field that remains mysterious to numerous policymakers and regulators (Truby, 2020; see also Chapter 10).

This chapter argues that politics remains the main element impacting the implementation of the 17 goals regardless of whether disruptive technologies are used and despite their well-recorded advantages (Keping, 2018). Even with the technological developments taking place, the political interests of various nations affect whether a specific SDG shall be achieved. This resulted in the emergence of a vast literature on the interplay between politics and governance theoretically and in practice (Eraydin & Frey, 2019) in various fields such as economics (Hickey et al., 2015) and development (Schofield & Caballero, 2015).

To prove the aforementioned claim, the author focuses implicitly and explicitly on several goals, specifically SDGs 2, 3, 6, 12, 16, and 17. This chapter analyzes these objectives through two case studies. The first concerns the use of Big Data for transboundary water resource management. The second addresses the deployment of disruptive technologies in the agricultural sector. This chapter first starts with a brief overview of the interplay between technology and politics. It then examines the two examples. In both cases, a focus on the impact of politics is emphasized.

14.2 TECHNOLOGY AND POLITICS

The interplay between technology and politics has been discussed in the literature from various angles (Papacharissi, 2015; Kurgan, 2013; Street, 1992; Wills, 2008; Winner, 1977). This is because the rules applicable to technology have a political nature establishing boundaries, rights, and obligations in the public and private domains (Sussman, 1997) and impact the governance system in place. This has been the case, for instance, with the rise of the Internet affecting political regimes (Weare, 2006). The relationship between these two notions changes with the emergence of new eras where the state attempts to regulate and use technological developments for political purposes (Schot, 2003). For instance, the government adopts policies concerning the diffusion of renewable energy (Jacobsson & Lauber, 2006). Technology also drives politics related to energy and climate change (Schmidt & Sewerin, 2017). Sometimes, such developments are banned when it does not suit the state's political goals (Meckling & Nahm, 2019). All this leads to technological and political change based on the situation (Street, 1992).

Globally, questions are raised on whether technological progress or politics will shape the course of international governance (Levy, 1975) and as to why certain nations are better than others in the technological and scientific fields (Taylor, 2016). This is mainly because such developments are seen through the lens of power in international relations (McCarthy, 2015), as its impact on politics has already been noticed. However, scholars have argued that there is an overestimation of its effect on nations, cultures, and military innovations (Deutsch, 1959). Others also claim that an exaggeration is taking place concerning the importance of politics in technological advancement (Asdal et al., 2008). This takes place in a context where some see technology as a means to advance society, whereas others are concerned about its negative consequences (Mayer et al., 2014). This has resulted in the emergence of various concepts to highlight this interdependency, such as "Digital Politics" (Karpf, 2017), "Technological Determinism" (Agre, 2002), "Voluntarist Views of Technology" (van der Ploeg, 2003), and "Technopolitics" (Kurban et al., 2017). Some have gone further in their classification. For instance, Jasanoff (2008, p. 745) argued that technology as a "site and object of politics displays itself clearly in four linked yet separate aspects: as risk, as design, as standard, and as ethical constraint". This focus on the classification of technology is understandable given the complete reliance on it in all sectors (Asaro, 2000) and the public misinterpretation and understanding of its role in society (Bromley, 2002), and its occasional perception as a threat (González, 2005; Van Slyke, 2008). This has resulted in the emergence of Science and Technology Studies and Science, Technology, and Society (STS) as new fields tackling politics, governance, and regulatory practices, among other areas of concern (Irwin & Wynne, 1996; Webster, 1991).

Society is currently being ordered and organized in keeping with existing technologies, which has resulted in various political questions with respect to its neutrality and legitimacy as a technical means to achieve social ends (Introna, 2007). This is where politics is important as policymakers and other stakeholders such as industries and civil society organizations are seeking to integrate societal and ethical considerations into the technological sphere. The objectives are to address potential future technological problems, ensure the adaptability of the governance system, and allow citizen participation among other things (van Oudheusden, 2014). Thus, the relationship between technology and politics and the analysis of the interplay between both is expected to gain further importance (Brown, 2015), as technology is not neutral but impacted by politics (Delvenne & Parotte, 2019) and the latter is influenced by technological evidence (May, 2006).

This is why the law plays an important role in technological progress. Politics rely on the legislation that creates and regulates it in the general framework of justice and social order. It is the driving force behind the establishment of legal norms (Cerar, 2009). Politics include decisions taken by a group or part of a group, often in the form of a government concerning governance matters. The law is used to implement the outcome representing the authority of those who govern (Alexander, 2018). Legislations concerning technologies have already developed and are expected to be adopted in the future, reflecting politicians views on this matter (Salmerón-Manzano, 2021; Malby, 2018; Gifford, 2007; Mandel, 2007). It is a compromise that needs to be made to ensure that innovation is not stifled while citizens are still protected (Tranter, 2011). This is complicated as the law cannot catch up with the rapid technological advancements (Griffith, 2019).

14.3 BIG DATA FOR TRANSBOUNDARY WATER GOVERNANCE

This section tackles the impact of politics on the use of big data in the management of shared freshwaters. It shows that despite the promises of technology, interstate politics remain the principal factor affecting the way this resource is governed, thus influencing directly the realization of SDG 6 and indirectly goals 3, 12, 16, and 17.

14.3.1 Background

Water flow in a hydrological cycle, which does not recognize the existence of political boundaries or physical characteristics. Having data and information on this resource's cycle is essential for its long- and short-term governance. These data are used for monitoring, planning, policymaking, and designing infrastructure. Other types also affecting water management include data on policies and regulations, engineering, culture, and the various modes of water use, be it agricultural, industrial, and household consumption, among others. Data on the links between water resources and the ecosystem are equally important (Leb, 2020).

International water conventions and instruments, mainly the Convention on the Law of the Non-navigational Uses of International Watercourses (1997), the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992), and the 2008 Draft Articles on the Law of Transboundary Aquifers (Draft Articles, 2008) include explicit provisions related to the regular data and information exchange; the notification of natural and human triggered emergencies and planned measures (Ibrahim et al., 2022). Similar provisions are found in basin water agreements such as the revised Southern African Development Community Water Protocol (SADC, 2000).

The inability, unwillingness, absence, and insufficient exchange of data and information across state borders is one of the most challenging problems that affects the management of transboundary water resources. Nations can have the technical capacity to collect and share water data but may withhold such information to protect their bargaining positions. They might also lack the ability to collect and exchange data given the great costs associated with the process and the lack of institutional capacity (Ibrahim, 2020). Various factors culminate in this situation, such as the absence of compatible needs, mistrust among parties, and the inability to perceive benefits from cooperation (Chenoweth & Feitelson, 2001). New technologies are considered a means to address these issues (Gupta et al., 2020; World Economic Forum, 2018).

In the transboundary water context, data are collected from different institutions and disciplines such as social and hydrological sciences. Its great volume has emerged from various sources like satellites, social media, and monitoring stations providing instant information that must be factored into the decision-making process (Ibrahim et al., 2022). Its veracity is questioned as it is not clear as to what data are valuable in drawing up policies. Big Data through machine learning holds the promise of collecting, storing, managing, processing, and providing added value from a huge amount of variable water data that emerges rapidly. This new information, which is considered credible and timely, can be used for the management of shared water resources (Ibrahim, 2020). The importance of Big Data led to the establishment of projects such as the Big Data Analytics and Transboundary Water Collaboration for Southern Africa initiative to improve regional water management through this disruptive technology (Bocchino & Adkisson, 2020). The opportunities for Big Data in the water sector have led to an increased focus in the literature on this topic (Gohil et al., 2021).

14.3.2 Role of Politics

Water management in the transboundary context is extremely complicated. Each state usually looks to secure the biggest quantity of this resource, which is considered a matter of national security. The importance of politics has resulted in the emergence of a new term called "hydropolitics", based on which scholars have concluded that shared freshwater is simultaneously a source of conflict and cooperation (Bréthaut et al., 2022). Factors that play a role include whether a state has asymmetrical power in comparison to other nations that share the resource and whether the country holds an upstream or downstream position (Mirumachi & Allan, 2007). This is worsened by the overuse and pollution of shared freshwaters. Climate change, the rise in global population, and economic growth have impacted them negatively, too.

The literature shows that water challenges are mainly governance crises (Johns & VanNijnatten, 2021) and a political issue. The effectiveness of existing water conventions and instruments at the international, regional, and basin levels and joint water institutions depends on the political willingness of states to abide by established rules to solve matters such as water pollution (Ibrahim, 2020). Politics has played an important role in the drafting and adoption of international water conventions (McCaffrey, 2008), to the point where many provisions in these treaties have a political character (Eckstein, 2008). Its impact is far more obvious at the basin level such as the Nile river basin, which is shared among several countries, each of which has different interests and needs (Brunnie, 2008).

States may have different political positions and attitudes toward the use of big data, based on whether it will positively or negatively impact their water needs. Various scenarios can unfold as all or few nations or even one may decide to use Big Data. It is also possible that none of them use it. If all states agree to use Big Data, problems may unfold if they disagree over key areas of concern. If some states or even one nation agrees to deploy it, but others do not, more challenges may emerge. Why would any of the other countries accept the results of data processing if they do not participate in the process? What if each state uses its own big datasets and draws out different results? What data should be adopted to avoid bias? Why would nations accept new data that may leave them with less favorable conditions? Should a third party take on data processing to ensure objectivity (Ibrahim, 2020)? These are some of the political challenges facing big data; other technologies like geoengineering are likely to face similar issues (see Chapter 4).

When disruptive technologies are deployed with the promise of enhancing transboundary water management, politics remains the core element in deciding whether actual changes will occur. Suggestions have been made for the adoption of legal mechanisms to reduce the impact of politics and allow the efficient use of Big Data. These include the development of water protocols at the basin level, tackling only the question of big data including provisions pertaining to the integration of water and information from multiple databases and the establishment of water data administration funds or accounts to finance such operations. Globally, incorporating a new provision on disruptive technologies in international water law has been suggested (Ibrahim et al., 2022). Only time will tell whether such suggestions will be considered and will yield the needed outcomes.

Even though technology has great potential for the realization of SDG 6, on clean water and sanitation in the transboundary context, politics has been decisive on whether this objective shall be achieved. This reality indirectly affects the implementation of SDGs 3, 12, 16, and 17 (UN DESA, n.d.). The good management of shared water resources is essential for the health and well-being of the population, especially as water needs to be exploited responsibly through strong and just joint institutions to guarantee peace among states sharing it.

14.4 DISRUPTIVE TECHNOLOGIES IN THE AGRICULTURAL FIELD

This section shows that despite the proven positive influence of disruptive technologies in agriculture, a wide range of concerns pertaining to the relationship between farmers and agritech companies require the political intervention of the state. The aim is to regulate the relationship between both parties and ensure the adequate realization of SDG 2 explicitly and SDGs 3, 8, 9, 10, 12, 15, 16, and 17 implicitly.

14.4.1 Background

Agriculture is a risky business given its

> relatively low operational efficiency and small managerial power due to farm size limitations, a high level of uncertainty because of weather and environmental conditions, and a volatile balance between food supply and demand due to growing and breeding times of crops and livestock.
>
> (Osinga et al., 2022, p. 2)

Thus, investments were and are made to improve the efficacy of operations and reduce uncertainties. The aim is to ensure the production of food with great nutritional value; constant food supply and reduction of environmental harm; and various types of benefits including ecological, social, and economic ones (Osinga et al., 2022). Farming is complex and involves various costs such as those for labor and land. Farmers use expensive machines and equipment, fertilizers, and pesticides, and ensure proper irrigation (Paraforos et al., 2016). The agri-food sector is challenged by population growth and climate change, which results in environmental degradation (land, water, and air) in addition to loss of biodiversity and increase in foodborne diseases (Leader et al., 2020).

New technologies are reshaping the agricultural sector, which has led to the emergence of Agricultural Technology (AgriTech) as a field (Spanaki et al., 2022). These include smart farming technologies that have supported agricultural practices, digital ones that have applied big data and machine learning, and precision agriculture focused on using data collected from satellites and other technologies to improve productivity and reduce costs. These include AI, drones, crop monitoring, farming robotics, autonomous transport, radio frequency identification sensors, tracking, and Machine Learning and Analytics (Leader et al., 2020). Disruptive technologies focus on increasing productivity and decreasing economic and physical burdens, among others. The aim is to facilitate the work of a farmer by tackling difficult, unwanted and tiring work, which will give them time to focus on improving and developing the farm. For instance, AI allows the use of unmanned agricultural machinery, and Big Data leads to a detailed analysis of farming data to understand the ways in which farming practices can be improved (Ryan, 2020).

Globally, efforts have been made for the establishment of an International Digital Council for Food and Agriculture at the 12th Global Forum for Food and Agriculture in January 2020 in Berlin. Its role is to ensure the good use of digital technologies in the agricultural sector and is to be supported by various units and national governments. Additionally, an International Platform for Digital Food and Agriculture under the Food and Agriculture Organization framework was created (FAO, 2020). The International Organization for Standardization (ISO) has issued standards governing the use of digital technologies in agriculture and has established committees to that end (Gasiorowski-Denis, 2017; ISO, 2017). The World Bank, the Organisation for Economic Co-Operation and Development (OECD), and others have also begun addressing this topic (Mattson, 2019; OECD, n.d.).

14.4.2 Role of Politics

Despite the opportunities highlighted earlier due to the use of disruptive technologies in the agricultural sector, various political obstacles have emerged in recent years, requiring state intervention at the domestic level and the international community's attention (Wiseman et al., 2019; OECD, 2020). Innovation has led to the emergence of agritech companies such as Monsanto, Bayer, and John Deere. These are profit-driven, which has resulted in political practices that negatively affect farmers who are the main beneficiaries of their services (Moon, 2019).

Owing to the great costs associated with investing in new technologies and human capital, as well as technical knowhow, few agritech companies are expected to have the lion's share of the market, resulting in monopolies dictating the terms and conditions to farmers who are set to lose the most from this unbalanced situation (Schönfeld et al., 2018; Shastry & Sanjay, 2020). This is already resulting in farmers complete dependency on agritech service providers through strict and often harsh legal contracts that limit their capacity to abandon the contract altogether. Additionally, due to this, they are unable to seek the services of other agritech providers (Ryan, 2020). This is worsened by the fact that the agritech company with whom the farmer has signed a contract has all the data on the farm and the farmer does not know how these data are being used, which implies information asymmetry between both parties. The farmer does not know whether their agricultural data are disclosed to a third party, and whether agritech, as a result of these data, may impose different legal conditions on each farmer on a case-by-case basis. The legal contract signed between both parties does not protect the farmer, as they are usually extremely complicated and long-winded agreements (Ryan, 2020; Carbonell, 2016). Thus, the state has to intervene politically to organize the relationship. This has resulted in new and innovative laws. For example, the European Union adopted the Code of Conduct on Agricultural Data Sharing by Contractual Agreement to regulate data sharing in the field. The code contains detailed provisions on data ownership, access, control, portability, protection, transparency, privacy, and security; and liability and Intellectual Property Rights (European Union Code of Conduct, 2018). The American Farm Bureau Federation (AFBF) adopted the Privacy and Security Principles for Farm Data, which guide companies on education, ownership, collection, access, control, notice, transparency, and consistency, choice, portability, terms and definitions, disclosure, use and sale limitation, data retention and availability, contract termination, unlawful and anti-competitive activities, and liability and security safeguards (Ag Data Transparent, n.d.). These attempts, alongside the international community's efforts through the International Digital Council for Food and Agriculture, the International Platform for Digital Food and Agriculture, and ISO standards, aim to address the political challenges emerging from the use of disruptive technologies in agriculture.

Thus, in the agricultural field and despite the promises of disruptive technology as seen earlier, politics remains essential in deciding whether SDG 2 shall be achieved. It also affects the indirect implementation of SDGs 3, 8, 9, 10, 12, 15, 16, and 17 (UN DESA, n.d.). Good governance in the agricultural sector has impacts on land, health, well-being, work opportunities especially for farmers, and the overall economic growth of the country. It has a great influence on the industries, mainly those investing in this sector and ensuring that equality and responsible consumption and production take place. All this must unfold while ensuring the existence of peaceful and inclusive societies within the general framework of partnerships among many stakeholders.

14.5 CONCLUSION

Politics remain the core element that determines whether disruptive technologies can help improve the implementation of the SDGs (Ibrahim et al., 2022). The question is then how we address the interplay between politics and technology in the sustainability field. One way is to tackle this through regulations (see Chapter 10). As seen earlier, rules are being developed internationally, regionally, nationally, and locally to address this topic and for the realization of the 17 goals (Schönfeld et al., 2018). Scientists should be given a greater role to play in the decision-making process to avoid having politicians with different agendas drive the use of these technologies in the sustainability field (Siddhpura et al., 2020; Jameson, 2014). This will not solve the problem of politics but rather help reduce its impact (Susskind, 2018; McCarthy, 2018; Hilpert, 2016; Jacobsen, 2015).

It is left to the voluntary will of each state to use disruptive technologies efficiently for the fulfillment of the SDGs and report on the application through the follow-up and review mechanism established for tracking progress (High-Level Political Forum on Sustainable Development, 2021; VNR, 2019, 2020). This would happen once a nation sees that the political benefits far outweigh disadvantages at various levels (Ibrahim et al., 2022). The growing literature on the topic has highlighted the increasing interest in the interplay between the SDGs and disruptive technologies by various stakeholders, including states, which will eventually impact the role of politics in this area (Iizuka & Hane, 2021; UNCTAD, 2019; IISD, 2017; ITU, 2021).

14.6 REFERENCES

Ag Data Transparent. (n.d.). *Ag data's core principles: The privacy and security principles for farm data*. www.agdatatransparent.com/principles#:~:text=Farm%20data%20should%20be%20protected,a%20breach%20should%20be%20established.

Agre, P. E. (2002). Real-time politics: The internet and the political process. *The Information Society*, *18*(5), 311–331.

Akkucuk, U. (Ed.). (2021). *Disruptive technologies and eco-innovation for sustainable development*. IGI Global.

Alexander, L. (2018). Law and politics: What is their relation? *Harvard Journal of Law & Public Policy*, *41*(1), 355–363.

Asaro, P. M. (2000). Transforming society by transforming technology: The science and politics of participatory design. *Accounting, Management and Information Technologies*, *10*(4), 257–290.

Asdal, K., Borch, C., & Ingunn Moser, I. (2008). The technologies of politics. *Distinktion: Journal of Social Theory*, *9*(1), 5–10.

Bocchino, C., & Adkisson, K. (2020, July 28). Using big data analytics for transboundary water management. *New Security Beat*. www.newsecuritybeat.org/2020/07/big-data-analytics-transboundary-water-management/

Bréthaut, C. et al. (2022). Exploring discursive hydropolitics: A conceptual framework and research agenda. *International Journal of Water Resources Development*, *38*(3), 464–479.

Bringing Ingenuity to Life. (n.d.). *Achieving the UN sustainable development goals*. www.paconsulting.com/insights/sustainability/united-nations-global-compact/

Bromley, D. A. (2002). Science, technology, and politics. *Technology in Society*, *24*(1/2), 9–26.

Brown, M. B. (2015). Politicizing science: Conceptions of politics in science and technology studies. *Social Studies of Science*, *15*(1) 3–30.

Brunnie, J. (2008). Law and politics in the Nile basin. *Proceedings of the ASIL Annual Meeting*, *102*, 359–363.

Carbonell, I. M. (2016). The ethics of big data in big agriculture. *Internet Policy Review*, *5*(1), 1–13.

Cerar, M. (2009). The relationship between law and politics. *Annual Survey of International & Comparative Law*, *15*(1), 19–23.

Chenoweth, J. L., & Feitelson, E. (2001). Analysis of factors influencing data and information exchange in international river basins: Can such exchanges be used to build confidence in cooperative management? *Water International*, *26*(4), 499–512.

Convention on the Protection and Use of Transboundary Watercourses and International Lakes, March 17, 1992. https://unece.org/fileadmin/DAM/env/water/pdf/watercon.pdf

Draft articles on the Law of Transboundary Aquifers. Adopted in 2008. https://legal.un.org/ilc/texts/instruments/english/draft_articles/8_5_2008.pdf

Delvenne, P., & Parotte, C. (2019). Breaking the myth of neutrality: Technology assessment has politics, technology assessment as politics. *Technological Forecasting and Social Change*, *139*, 64–72.

Deutsch, K. W. (1959). The impact of science and technology on international politics. *Quantity and Quality*, *88*(4), 669–685.

Doyle, M. (2021, June 30). The role of sustainable technologies in achieving the SDGs. *Academy Insights*. https://theworldwecreate.net/insights/role-of-sustainable-technologies-in-achieving-sdgs

Eckstein, G. (2008). Examples of the political character of international water law. *Proceedings of the ASIL Annual Meeting*, *102*, 364–366.

ECOSOC, United Nations Economic and Social Council, Commission on Science and Technology for Development. (2019, May 13–17). *The impact of rapid technological change on sustainable development*. Report of the Secretary-General; Twenty-second session; Geneva; Item 3 (a) of the provisional agenda; Distr.: General, March 4, 2019.

Eraydin, A., & Frey, K. (Eds.). (2019). *Politics and conflict in governance and planning: Theory and practice*. Routledge.

European Union Code of Conduct on agricultural data sharing by contractual agreement adopted in 2018.

FAO, Food and Agriculture Organization of the United Nations. (2020). *Hundred and sixty-fourth session; 6–10 July; international platform for digital food and agriculture*. Annex: Realizing the Potential of Digitalization to Improve the Agri-Food System: Proposing a New International Digital Council for Food and Agriculture: A Concept Note.

Gasiorowski-Denis, E. (2017, May 9). *The future of farming*. International Organization for Standardization. www.iso.org/news/Ref2183.htm

Gifford, D. J. (2007). Law and technology: Interactions and relationships. *Minnesota Journal of Law Science & Technology*, *8*(2), 571–587.

Gohil, J. et al. (2021). Advent of big data technology in environment and water management sector. *Environmental Science and Pollution Research*, *28*, 64084–64102.

González, W. J. (Ed.). (2005). *Science, technology and society: A philosophical perspective*. Netbiblo.

Griffith, J. (2019, April 12). A losing game: The law is struggling to keep up with technology. *Journal of High Technology Law at Suffolk University Law School*. https://sites.suffolk.edu/jhtl/2019/04/12/a-losing-game-the-law-is-struggling-to-keep-up-with-technology/

Gupta, A. D. et al. (2020). Smart water technology for efficient water resource management: A review. *Energies*, *13*, 1–23.

Hickey, S., Sen, K., & Bukenya, B. (Eds.). (2015). *The politics of inclusive development: Interrogating the evidence*. Oxford University Press.

High-Level Political Forum on Sustainable Development. (2021). *Voluntary national reviews at the 2021 High-level political forum on sustainable development*. Secretariat Background Note.

Hilpert, U. (Ed.). (2016). *Routledge handbook of politics and technology*. Routledge.

Ibrahim, I. A. (2020). Legal implications of the use of big data in the transboundary water context. *Water Resources Management*, *34*, 1139–1153.

Ibrahim, I. A., Brown, R. D., & Jon Truby, T. (2022). *Big data analytics and its impact on basin water agreements and international water law: A study of the Ramotswa aquifer*. Brill.

Iizuka, M., & Hane, G. (2021). Towards attaining the SDGs: Cases of disruptive and inclusive innovations. *Innovation and Development*, *11*(2/3), 343–364.

International Institute for Sustainable Development. (2017, October 11). *Why innovation is critical to achieving the sustainable development goals*. www.iisd.org/articles/insight/why-innovation-critical-achieving-sustainable-development-goals

ISO. (2017). Smart farming. *ISO Focus*, *12*.

International Telecommunication Union. (2021). *Digital technologies to achieve the UN SDGs*. www.itu.int/en/mediacentre/backgrounders/Pages/icts-to-achieve-the-united-nations-sustainable-development-goals.aspx

Introna, L. D. (2007). Maintaining the reversibility of foldings: Making the ethics (politics) of information technology visible. *Ethics and Information Technology*, *9*, 11–25.

Irwin, A., & Wynne, B. (1996). *Misunderstanding science? The public reconstruction of science and technology*. Cambridge University Press.

Jacobsen, K. L. (2015). *The politics of humanitarian technology: Good intentions, unintended consequences and insecurity*. Routledge.

Jacobsson, S., & Lauber, V. (2006). The politics and policy of energy system transformation–explaining the German diffusion of renewable energy technology. *Energy Policy*, *34*(3), 256–276.

Jameson, J. L. (2014). Disruptive innovation as a driver of science and medicine. *The Journal of Clinical Investigation*, *124*(7), 2822–2826.

Jasanoff, S. (2008). Technology as a site and object of politics. In R. E. Goodin & C. Tilly (Eds.), *The Oxford handbook of contextual political analysis* (pp. 745–764). Oxford University Press.

Johns, C., & VanNijnatten, D. (2021). Using indicators to assess transboundary water governance in the Great Lakes and Rio Grande-Bravo regions. *Environmental and Sustainability Indicators*, *10*, 1–13.

Karpf, D. (2017). Digital politics after Trump. *Annals of the International Communication Association*, *41*(2), 198–207.

Keping, Y. (2018). Governance and good governance: A new framework for political analysis. *Fudan Journal of the Humanities and Social Sciences*, *11*, 1–8.

Kurban, C., Peña-López, I., & Haberer, M. (2017). What is technopolitics? A conceptual schema for understanding politics in the digital age. *Revista de Internet, Derecho y Política*, *24*(24), 3–20.

Kurgan, L. (2013). *Close up at a distance: Mapping, technology, and politics*. Zone Books.

Leader, J. et al. (2020). *Disruptive technologies in the agri-food sector*. Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA).

Leb, C. (2020). *Data innovations for transboundary freshwater resources management: Are obligations related to information exchange still needed?* Brill.

Levy, S. A. (1975). INTELSAT: Technology, politics and the transformation of a regime. *International Organizations*, *29*(3), 655–680.

Malby, S. (2018). Strengthening the rule of law through technology. *Commonwealth Law Bulletin*, *43*(3/4), 307–317.

Mandel, G. N. (2007). History lessons for a general theory of law and technology. *Minnesota Journal of Law Science & Technology*, *8*(2), 551–570.

Mattson, S. (2019, June 13). *CIAT, World Bank and partners announce digital agriculture country profiles initiative*. https://blog.ciat.cgiar.org/ciat-world-bank-and-partners-announce-digital-agriculture-country-profiles-initiative/

May, C. (2006). Mobilising modern facts: Health technology assessment and the politics of evidence. *Sociology of Health & Illness*, *28*(5), 513–532.

Mayer, M., Carpes, M., & Knoblich, R. (2014). The global politics of science and technology: An introduction. In M. Mayer, M. Carpes, & R. Knoblich (Eds.), *The global politics of science and technology: Concepts from international relations and other disciplines* (pp. 1–35). Springer.

McCaffrey, S. C. (2008). Introduction: Politics and sovereignty over transboundary groundwater. *Proceedings of the ASIL Annual Meeting*, *102*, 353–355.

McCarthy, D. R. (2015). *Power, information technology, and international relations theory: The power and politics of US foreign policy and the internet*. Springer.

McCarthy, D. R. (Ed.). (2018). *Technology and world politics: An introduction*. Routledge.

Meckling, J., & Nahm, J. (2019). The politics of technology bans: Industrial policy competition and green goals for the auto industry. *Energy Policy*, *126*, 470–479.

Millar, C., Lockett, M., & Ladd, T. (2018). Disruption: Technology, innovation and society. *Technological Forecasting and Social Change*, *129*, 254–260.

Mirumachi, N., & Allan, J. A. (2007). Revisiting transboundary water governance: Power, conflict cooperation and the political economy. In *Proceedings from CAIWA international conference on adaptive and integrated water management: Coping with scarcity* (Vol. 1215). Basel, Switzerland.

Mohieldin, M. (2018, May 10). Leveraging technology to achieve the sustainable development goals. *World Bank Blogs*. https://blogs.worldbank.org/voices/leveraging-technology-achieve-sustainable-development-goals

Moon, E. (2019). *Big ag monopolies have stifled small farmers. 2020 democrats want to break them up*. https://psmag.com/social-justice/big-ag-monopolies-have-stifled-small-farmers-2020-democrats-want-to-break-them-up

Organization for Economic Co-Operation and Development. (2020). *Issues around data governance in the digital transformation of agriculture – The farmers perspective*. Trade and Agriculture Directorate Committee for Agriculture; Working Party on Agricultural Policies and Markets.

Organisation for Economic Co-operation and Development. (n.d.). *New technologies and digitalisation are transforming agriculture and offering new opportunities to improve policy*. www.oecd.org/agriculture/topics/technology-and-digital-agriculture/

Osinga, S. A. et al. (2022). Big data in agriculture: Between opportunity and solution. *Agricultural Systems*, *195*, 1–12.

Papacharissi, Z. (2015). *Affective publics: Sentiment, technology, and politics*. Oxford University Press.

Paraforos, D. S. et al. (2016). A farm management information system using future internet technologies. *IFAC-PapersOnLine*, *49*(16), 324–329.

Ryan, M. (2020). Agricultural big data analytics and the ethics of power. *Journal of Agricultural and Environmental Ethics*, *33*, 49–69.

SADC – Southern African Development Community. (2000). *Revised protocol on shared watercourses*. https://www.sadc.int/document/revised-protocol-shared-watercourses-2000-english

Salmerón-Manzano, E. (2021). Laws and emerging technologies. *Laws*, *10*(2), 2–3.

Schmidt, T. S., & Sewerin, S. (2017). Technology as a driver of climate and energy politics. *Nature Energy*, *2*(17084), 1–3.

Schofield, N., & Caballero, G. (Eds.). (2015). *The political economy of governance: Institutions, political performance and elections*. Springer.

Schönfeld, M. V., Heil, R., & Bittner, L. (2018). Big data on a farm–Smart farming. In T. Hoeren & B. Kolany-Raiser (Eds.), *Big data in context: Legal, social and technological insights* (pp. 109–120). Springer.

Schot, J. (2003). The contested rise of a modernist technology. In T. J. Misa, P. Brey, & A. Feenberg (Eds.), *Modernity and technology* (pp. 257–278). The MIT Press.

Shastry, K. S., & Sanjay, H. A. (2020). Data analysis and prediction using big data analytics in agriculture. In K. Pattnaik, R. Kumar, & S. Pal. (Eds.), *Internet of things and analytics for agriculture* (pp. 201–224). Springer.

Siddhpura, A. et al. (2020). Current state of research in application of disruptive technologies in engineering education. *Procedia Computer Science*, *172*, 494, 494–501.

Sousa, M. J., Melé, P. M., & Gómez, J. M. (2020). Technology, governance, and a sustainability model for small and medium-sized towns in Europe. *Sustainability*, *12*(3), 1–15.

Spanaki, K. et al. (2022). Disruptive technologies in agricultural operations: A systematic review of AI-driven Agritech research. *Annals of Operations Research*, *308*, 491–524.

Street, J. (1992). *Politics and technology*. The Macmillan Press.

Susskind, J. (2018). *Future politics: Living together in a world transformed by tech*. Oxford University Press.

Sussman, G. (1997). *Communication, technology, and politics in the information age*. Sage Publications.
Taylor, M. Z. (2016). *The politics of innovation: Why some countries are better than others at science and technology*. Oxford University Press.
Tranter, K. (2011). The laws of technology and the technology of law. *Griffith Law Review*, *20*(4), 753–762.
Truby, J. (2020). Governing artificial intelligence to benefit the UN sustainable development goals. *Sustainable Development*, *28*(4), 946–959.
UN DESA. (n.d.). *Do you know all 17 SDGs?* United Nations Department of Economic and Social Affairs. https://sdgs.un.org/goals
United Nations Conference on Trade and Development. (2019, May 13). *Deploying disruptive innovations for the SDGs*. https://unctad.org/news/deploying-disruptive-innovations-sdgs
United Nations Convention on the Law of the Non-navigational Uses of International Watercourses, May 21, 1997, https://legal.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf
van der Ploeg, I. (2003). Biometrics and privacy: A note on the politics of theorizing technology. *Information, Communication & Society*, *6*(1), 85–104.
van Oudheusden, M. (2014). Where are the politics in responsible innovation? European governance, technology assessments, and beyond. *Journal of Responsible Innovation*, *1*(1), 67–86.
Van Slyke, C. (2008). *Information communication technologies: Concepts, methodologies, tools, and applications*. IGI Global.
Voluntary National Reviews. (2019). *Submitted to the 2019 high-level political forum for sustainable development: A comparative analysis*. https://sdghelpdesk.unescap.org/e-library/voluntary-national-reviews-submitted-2019-high-level-political-forum-sustainable
Voluntary National Reviews. (2020). *A snapshot of trends in SDG reporting*. https://sdghelpdesk.unescap.org/e-library/2020-voluntary-national-reviews-snapshot-trends-sdg-reporting
Weare, C. (2006). The internet and democracy: The causal links between technology and politics. *International Journal of Public Administration*, *25*(5), 659–691.
Webster, A. (1991). *Science, technology and society: New directions*. Palgrave Macmillan.
Wills, D. (2008). *Dorsality: Thinking back through technology and politics*. University of Minnesota Press.
Winner, L. (1977). *Autonomous technology: Technics-out-of-control as a theme in political thought*. MIT Press.
Wiseman, L. et al. (2019). Farmers and their data: An examination of farmers reluctance to share their data through the lens of the laws impacting smart farming. *NJAS-Wageningen Journal of Life Sciences, 90/91*, 1–10.
World Economic Forum. (2018). Harnessing the Fourth Industrial revolution for water. *Fourth Industrial Revolution for the Earth Series*. https://www3.weforum.org/docs/WEF_WR129_Harnessing_4IR_Water_Online.pdf