Annex F. Role of innovation in addressing data gaps

The rapid development of technology has led to an explosion in the volume and types of data that can be collected across many sectors of the economy, society and environment. Biodiversity is no different and several novel, emerging or developing technologies have the potential to change the types of data that can be collected and the way existing data can be used by the public sector, private sector and private individuals. Table A F.1 provides a brief overview of four technologies that are likely to have significant impacts on the generation and usage of data for biodiversity.

In some cases these impacts are being felt already, for example emerging AI techniques, combined with remoting data collection from camera traps and acoustic monitoring, has already proved a powerful tool for identifying species and even individual animals (Kwok, 2019[56]). The increased capacity for monitoring that results from these new technologies will be a boon to both the private and public sectors, if harnessed effectively. Relatively rapid, cheap and technically simple DNA sequencing for example, could increasing the efficacy of monitoring wildlife trade by facilitating the identification of species and place of origin for objects without the need for specific expertise. Blockchain technology could be used to ensure end-to-end transparency of supply chains, enhancing the ability of retailer to ensure sustainability of end products. Further, democratising sustainability data though technologies such as blockchain, allows individual consumers to make informed choices about the sustainability of their own consumption, without the need to rely on often opaque and confusing certification standards. This is also true with biodiversity data, where growing data platforms such as GBIF and ebird function not only as databases monitoring biodiversity state changes, but also as vital public engagement portals, though with individuals, particularly youth, can re-engage with biodiversity.

Finally, the emergence of new technologies represents a major opportunity for new business. Earth observation from space, for example, is worth USD 7.5 billion a year and is estimated to grow by 15% a year until 2019 (PwC, 2019[57]). Many additional opportunities will likely emerge though investment in new technology. The G7 can play a key role in leading the development and implementation of innovations for biodiversity.

Table A F.1. Examples of innovation for biodiversity

Technology	Data generated	Innovation and availability	Data Gap addressed	Key beneficiaries	Caveats
Nanopore DNA sequencing	DNA sequence data	Allows for the manufacture of desktop DNA sequencers, which are highly mobile, rapid at a much lower cost than more traditional techniques. Available now, but more research needed for full application	Genetic diversity, microbial diversity, monitoring and enforcement of wildlife trade (through sample identification)	Public sector, Private sector	Complementary DNA library and barcodes need to be developed to utilise effectively
Block chain	NA	The structure of a block chain database, should allow for the entire supply chain of a product to be accessible by the end-user, be that the consumer or retailers. Currently available	Supply chain sustainability, transparency of product origin. Useful for food, beverages, timber and other wildlife products	Public Sector, Private sector, Individuals	High energy use and not currently mobilised
Artificial intelligence (AI) and machine learning	Various	Remote sensing networks generate vast quantities of data (for example camera traps and acoustic monitoring). AI techniques can process this data into useful information which can them be used to monitor many dimensions of biodiversity (species occurrence, population dynamics, habitat disturbance)	State, pressures and responses	Public Sector, Private sector, Individuals	Availability of training data is low for many cases, creating training libraries is labour intensive
Citizen led data collection	Various	Democratises biodiversity data collection, currently utilised widely, most notably though GBIF. Allows for individual engagement with biodiversity	State of biodiversity	Public Sector, Individuals	Data generated is difficult to use and biased, requires more sophisticated analytical techniques than currently available (better developed AI for example)