

Background Note on a proposed World Bank Digital Earth Partnership

Rationale

Accelerating Action on the 2030 Agenda

The United Nations called the 2020's as the Decade of Action for the 2030 Agenda on Sustainable Development Goals before the global COVID-19 pandemic hit. Now, in 2021, the international community stands at a critical point, facing two global crises of immense proportions that threaten the progress in international development: COVID-19 and Climate Change.

In January 2021, the World Bank updated its estimates on the impact the COVID-19 pandemic has had on the global poor and calculated that between 119 and 124 million people have been pushed into extreme poverty as a result – a doubling from the first estimate in April 2020. Compounding this economic and social shock are the impacts of Climate Change which has intensified in recent years.

These crises affect especially hard the poorest and more vulnerable, those who are also taking the brunt of regional crises derived natural disasters and violent conflict. For low- and middle-income countries, this could be a lost decade. Malnutrition rates are increasing around the world and child mortality is expected to rise by 45 percent globally. Closed schools have impacted the access to opportunities for acquiring knowledge, and skills specially for the youth but also for women.

The World Bank has stated that its goal of reducing extreme poverty to below 3 percent by 2030 may now be unachievable and that “exceptional and urgent global action must tackle the combined impact of cascading crises while adapting to post-pandemic realities.”¹

This need for a new approach to development that is adequate for the challenges of today— the COVID-19 pandemic, climate change, and growing inequality – has framed the World Bank Group's Spring Meetings 2021 agenda. The focus has been on a Green, Resilient, and Inclusive Development (GRID) framework that will enable a collective response to compounding risks and the interconnected nature of today's crises.

To implement this agenda, the World Bank aims to develop better lines of sight into the future, to provide credible and evidence-based guidance for investments and ensure that these are backed by solid evidence for efficiency and sustainability. The World Bank President David Malpass declared recently that the new approach intends to help countries accelerate the development and adoption of digital technologies² for development.

Digital Earth Opportunity

New generation and next generation digital earth imaging technologies can support a step-change in service delivery and data for a smart recovery and the 2030 agenda. New approaches that can significantly

¹ World Bank, (2021), Development Committee, From COVID-19 Crisis Response to Resilient Recovery - Saving Lives and Livelihoods while Supporting Green, Resilient and Inclusive Development (GRID)

² WBG President David Malpass, Speech at the London School of Economics, March 29 2021, online at: <https://www.worldbank.org/en/news/speech/2021/03/29/building-a-green-resilient-and-inclusive-recovery-speech-by-world-bank-group-president-david-malpass>

scale the coverage and frequency of data collection whilst also lowering the costs and complexities involved are both necessary and possible.

The United Nations committee of experts on Global Geospatial Information Management, in their latest report, highlights the relevance of the digital revolution in geodata for tackling the macro challenges of climate change, public health and population change compounded by the pandemic. It asserts that technology – from increasing levels of automation to the Internet of things, Big Data, Artificial Intelligence, immersive technology and the rise of Digital Twins - represents great opportunities and challenges to those trying to prioritise recovery efforts and accelerate action on the 2030 agenda.

The expert committee predicts an unprecedented disruption that both private sector and public agencies face as a result from the volume, size, speed, variety, and complexity in which geospatial data is generated³. In addition, reductions in cost and complexity of Earth Observation services – from more affordable drones and satellite technologies benefitting from image classification capabilities – will bring benefits to developing nations and small island developing states that suffer from a significant geospatial digital divide.

The 2021 World Development Report: Data for Better Lives also identifies the “tremendous potential of the changing data landscape to improve the lives of poor people, while also acknowledging its potential to open back doors that can harm individuals, businesses, and societies”.

The UK AID Frontier Technologies published in 2020 a guide to new opportunities on how to release the power of digital data for development concluding:⁴

1. There is justified excitement and proven benefits in the use of new digital data sources;
2. Combining new and traditional data sources is more effective than just new data alone;
3. Decision making around new data sources should be highly devolved;
4. Strong ethical frameworks for new data services are needed to avoid harming the vulnerable;
5. The highest potential added value new data source for exploitation now are Earth Observation (including satellites and drones) and passive location data from mobile phones;
6. Artificial Intelligence techniques such as machine learning have high potential to add value.
7. Next generation emerging data sources are likely to be: Artificial intelligence, next generation Earth observing platforms, privacy preserving data sharing, and the Internet of things.
8. An enabling environment for standards, for open data, data sharing, security, learning and continued support for capacity building in developing nations remains relevant for success.

Both the UN report and the UK AID Frontier Data study make the case for increased investments in new geodata sources and related services, but also call for changes to the processes by which these services are developed. The pace of change of technology, emergence of global and local actors and digital services, and opportunity for accelerated impact, suggest a need to pivot towards cocreation models. Partnerships that support the hybridization of traditional and new data models, as well as developing inclusive opportunities for skills and innovation in demand driven manner.

The most promising opportunities are in new generation and next generation Earth Observing technologies – satellite and drones when incorporated together with a broader digital value chain such as local data training and calibration data as well as artificial intelligence tools.

³ UNGGIM, (2020), Future Trends in Geospatial Information management: the five to ten year vision, Third Edition

⁴ UKAID, (2020), Frontier Data Study: Releasing the power of digital data for development

Satellite technology has been used successfully at the World Bank, as it can convey information quickly and cost-effectively through clear visual impressions⁵. Furthermore, there is an ongoing revolution in satellite remote sensing capabilities – with increasing temporal frequencies of measurements, greater variety of sensing modes and great standardization of archives and service continuity. DigitalGlobe and Ecopia can detect buildings from satellite imagery with quarterly refresh rates⁶. Computer Vision competitions indicate that buildings and roads can accurately be extracted from satellite imagery⁷. However, these algorithms require a very large number of training samples, which must be representative for the application and geography in question. For example, building extraction algorithms trained with examples from European or North American cities may not work well in African cities, where buildings have a different appearance. Obtaining a representative collection of samples with which to train the algorithms can be expensive and time-consuming - especially in smaller and medium-sized Sub-Saharan African cities.

Partnership for Inclusive Innovation

The opportunity exists therefore to leverage new advances in satellite and remote sensing technologies for sustainable development. For this transition to be successful however, the flow of knowledge transfer as well as data and services must be two-way, with users enabled to contribute requirements, calibration and validation data, as well as able to build their own data ecosystems.

Digital Earth services, to have impact and remain sustainable, should strive for true cocreation between cutting edge technology providers and local ecosystem users and providers. Such service cocreation should also provide for inclusive opportunities to build skills, jobs and businesses locally in new and next generation Earth Observation.

⁵ <http://www.worldbank.org/en/news/feature/2013/08/20/earth-observation-for-development-success-stories>

⁶ <http://explore.digitalglobe.com/GBDX-Building-Footprints.html>

⁷ <http://deepglobe.org/index.html>

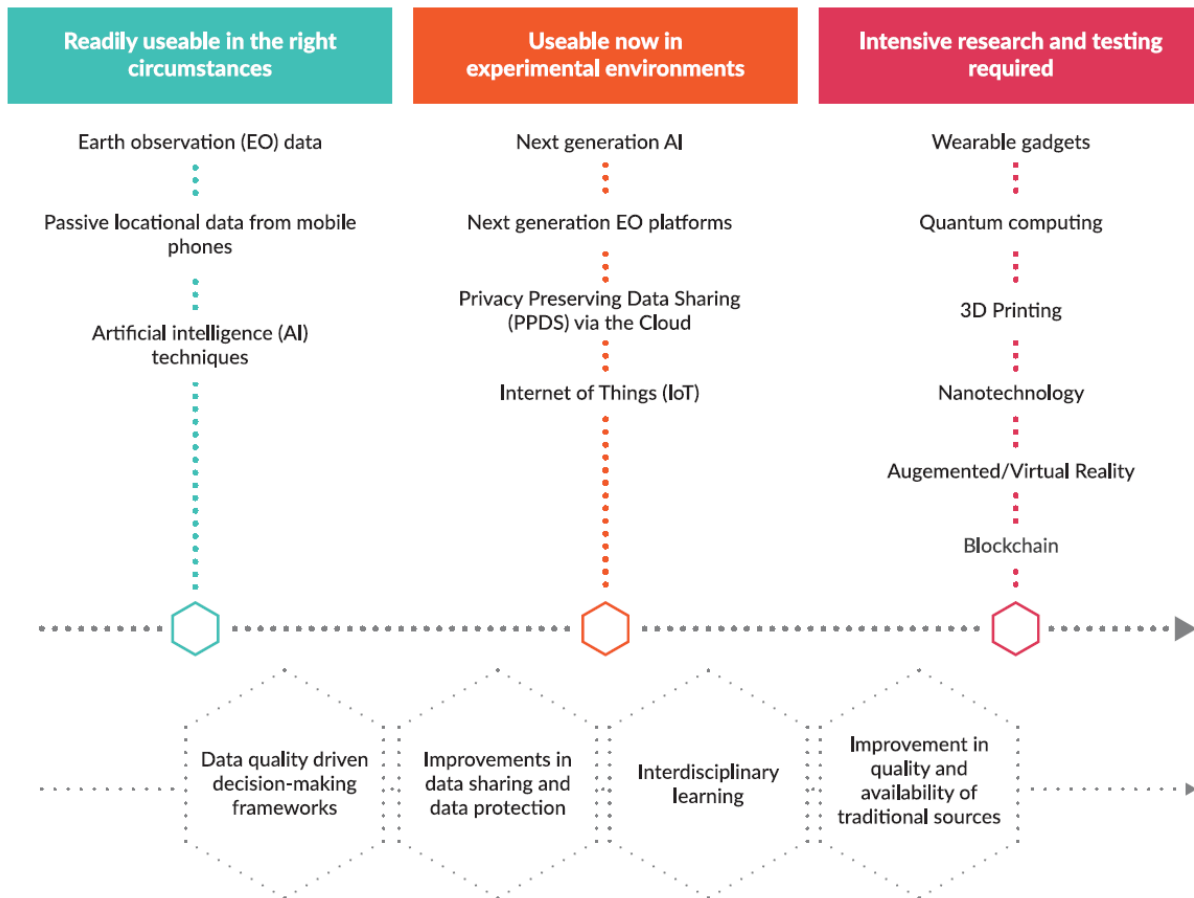


Figure 1 Summary of emerging opportunities in the digital data landscape, Source: UKAID, 2020, Frontier Data Study – releasing

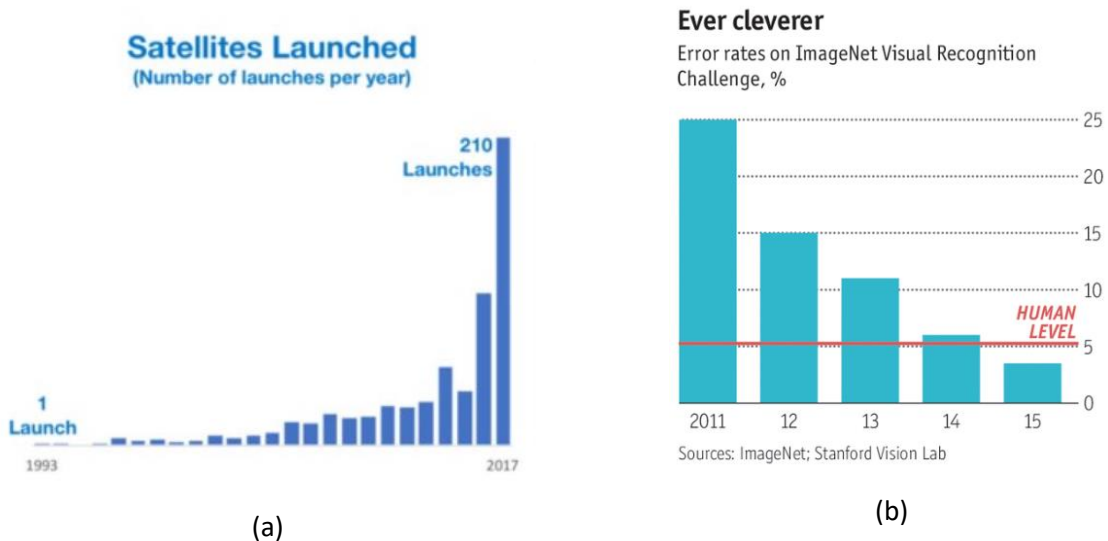


Figure 2: # Earth Observation satellites launched per year⁸ (a) and improvements in algorithms for image recognition tasks (b).

⁸ Source: UCS Satellite Database, <https://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.W6qBA2hKg2w>

Digital Earth Partnership

This note presents the case for a dedicated program to harness the opportunities and address the demand in adopting Digital Earth imaging technologies for Sustainable Development.

The goal of the program shall be to accelerate the world's adoption of new digital geospatial services for sustainable development. The envisaged development objective of such a program is to enhance the outcomes of service delivery across sustainable development sectors through improved data services for spatial monitoring, decision support and risk management activities, that are locally appropriate, affordable, scalable and sustainable.

The character of the program is to develop close working collaboration with both traditional development partners and national space agencies and institutions working to advance the effective use of new earth observing services.

Whilst a detailed program has yet to be defined, certain characteristics and guiding principles may be considered to incorporate the lessons learned of past efforts, build on the World Bank Group's comparative advantages, and work in alignment with the Bank's strategy and its new Green, Inclusive, Resilient Development (GRID) framework for sustainable development.

Guiding Principles

Key principles to guide such a program are:

1. Demand Driven: to ensure that program activities are rooted in the core needs and real-world demand from client governments and beneficiaries;
2. Scale and Sustainability: to prioritise the support to operational services with potential to scale and remain viable of time;
3. Cocreation: to adopt processes that provide for local participation opportunities in developing final services through combinations of global and local data as well as traditional and new methods;
4. Ethics: adopt and contribute to the enhancement of ethical frameworks for geodata use, including provisions for protecting vulnerable groups, addressing information bias, minimize intrusion, protect privacy, safeguard sensitive data from theft, and provide accountability.
5. Ecosystem: consider a broader view of the digital ecosystem relating to earth observation, including satellite, drones, internet of things, and traditional data providers, as well as the entire value chain of digital production and data lifecycles.
6. Inclusive Skills, Jobs and Opportunity: invest in local skills, capacity and service provision that leverages today's technologies and also prepares for the next generation, ensuring research and development that is inclusive and collaborative.
7. Standards: adhere to and promote the use of open standards for data licensing, sharing, security, and quality.

Program Activities

Lines of action for program activities may be:

1. Technical assistance: for demand-based services in development operations;
2. Training, capacity building and jobs: to develop local ecosystems of digital service providers, including digital opportunities and entrepreneurship.

3. Partnerships: for facilitating the supply and demand coordination in investment, trainings, and standards development.
4. Mainstreaming: of learning approaches and methods into World Bank Group staff and operations as well as client operations;
5. Standards and Guidance: of best practices for geodata safeguards and ethical considerations;
6. Public goods: provision and access to data, tools, services, and curricula that support the overall goals of the program;

The program shall focus on building capacity on both sides of the supply and demand markets for new services in geodata in sustainable development. Supply-side actors in the development context are the local providers of geospatial services such as data collection, analytics and decision support as well as monitoring and evaluation. Whereas demand-side actors are represented by the clients and user cases benefiting from such services.

Supply-side activities – may focus on developing the curricula, skills and opportunities for a vibrant geospatial services sector that has access and knowledge to utilize the latest earth observations services and integrate these into local production models. Target beneficiaries include university networks and students, civil servants and GIS staff, entrepreneurs and digital innovation hubs. This work includes the establishment of public good resources to facilitate access to data, learning content, analytical tools and algorithms, with a focus on catalogues, methods and skills that leverage low cost, open source, digital resources.

Demand-side Activities – may focus on the operational programs of governments that can benefit from new satellite services and aim to facilitate the design, adoption, and scale-up of operational services. Target groups would be government agencies, bank task teams and development partners responsible for designing and management interventions in sustainable development sectors. Activities can be:

Partnerships and Coordination

The Digital Earth Partnership will build on over 10 years of collaboration with European Space Agency (ESA) but shall also expand to play a coordinating role with additional programs and partners to connect demand for new digital earth services.

European Space Agency

A core partnership shall be to build upon the ESA Space partnership on Innovation for Global Development - a new program of ESA for 2020-2025. This program itself builds on the existing success of initiatives such as Earth Observation for Sustainable Development and will deploy ESA space budget, technical resources, and staff secondments to the World Bank, for new generation EO products and services that respond to needs developing countries.

The Digital Earth Partnership is expected to be a direct beneficiary of new services and innovation stimulated through the ESA program, as well as an equal partner on knowledge sharing and dissemination. At the same time, the Digital Earth Partnership – through the World Bank and participating Development Partners - is expected to provide inputs to the ESA activities – inputs beyond requirement specification, including having an active role in providing local datasets and beneficiary feedback that enhance service development and localization for client services.

Finally, the opportunity to jointly establish new global public goods – such as global baseline datasets, open access tools and curricula - exists between the two elements of the overall Space Partnership.

The ESA-WB Partnership on Space for Sustainable Development is expected to focus geographically on Africa, across all development sectors.

Additional Space and Technology Partners

The World Bank already works with a wide array of technical institutes, universities, and national space agencies in leveraging new technologies for sustainable development. Most partners contribute in-kind resources in the form of data services, research and analytics, or training materials. Examples include NASA's Harvest program for agriculture, UK Space Agency's Meteor project for natural hazard management and Germany's Aerospace Agency enhancement with the Bank of the World Settlement Footprint digital service to map global urban change.

Firms and institutes have also long been sources of innovation and collaboration and are expected to provide content in terms of research, training and access to data as well as benefit from access to and improved insights into emerging market needs and opportunities. Building such partnerships with nascent digital communities in developing countries is best supported by a Digital Earth Partnership serving as a trusted and neutral technology broker.

Participating Development Partners

The partnership is expected to work with interested development partners to scale the Digital Earth opportunity globally – specific thematic or geographical priorities of development partners can be reflected through specific program windows. The national program of Development Partners with thematic alignment are also important opportunities for partnerships for dissemination, scale and impact.

Coordination with Other Programs

The World Bank Group manages a wide range of development programs internally with high relevance for alignment on the Digital Earth Partnership. In addition, external partnerships are key for innovation, mainstreaming, scale and efficiency. A key function of the Digital Earth Partnership shall be to develop appropriate coordination mechanisms to align internally and externally on new geodata services for stakeholders.

World Bank Group Comparative Advantages

The World Bank is well positioned to deliver this program as it is ideally aligned to the regional and sectoral strategies. The Bank's key competences as a provider of finance, technical assistance and policy dialogue on both sides of the supply and demand ecosystem are crucial for catalyzing operation and routine services of Earth observing technologies.

In addition, the Bank is itself also a major user and producer of geospatial analytics with an identified priority to reform and scale up its own activities. In particular, the importance of addressing Fragility and Conflict States is seen as a driver of demand for these services to facilitate regional monitoring, identification of vulnerable groups and key beneficiaries, as well as for tracking development outcomes and progress towards the Sustainable Development Goals.