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7 September 2021

Assessment of Innovative Technologies and Their Readiness for Remote Sensing-Based Estimation of Forest Carbon Stocks and Dynamics

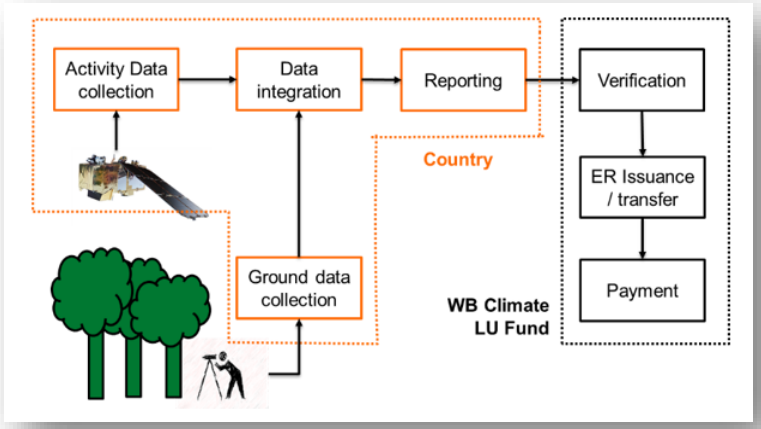
GFOI Plenary 2021 - Side Event: **Estimating Carbon Stocks from Space: Importance of in-situ data**

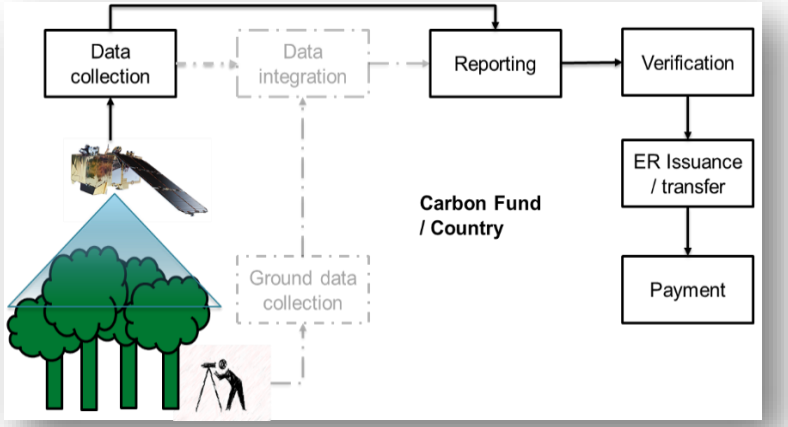
Andres Espejo, World Bank

WHAT IS THE ISSUE AND THE SOLUTION?

MRV systems are complex and human-dependent → not efficient, i.e. 6-22 months

EO combined with innovative technologies could enable a more automatized system → more efficient, i.e. 3-6 months





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How can we get to the solution?

- The WB published in June 2021 a study on the readiness of **innovative technologies for RS-based estimation of carbon stock dynamics**
- Result from in-depth bibliography review and the participation of more than 200 international experts
- Conclusions served to define the policy pathways for an MRV 2.0
- The analytical study assessed **the status and gaps** of technologies in four different domains:
  - Remote sensing;
  - Artificial Intelligence (AI);
  - Geostatistics (GS); and
  - Cloud Computing

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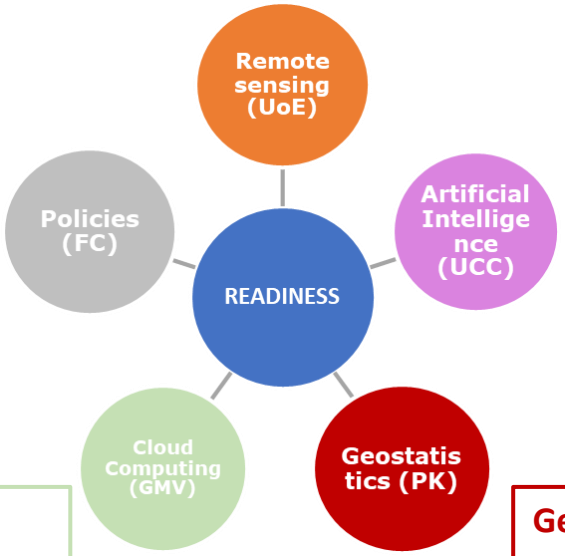
INNOVATIVE TECHNOLOGIES – STATUS AND GAPS

Remote sensing

- Status → Combination of LiDAR data and L-band SAR (ALOS series, SAOCOM) **enables direct carbon stock estimation**
- Gap → Access to **in-situ data** (and partly RS data) **main challenge**

Policies

- Status → **RS data access has been improved greatly** and new technologies recognized initially under IPCC
- Gaps → **Lack of standardization**, inadequate data access and sharing policies (in-situ data),…



Artificial Intelligence (AI):

- Status → **AI could bring significant improvements** to different operations of the process (e.g., curation, data processing,…).
- Gap → There is currently a **gap between the AI and RS community**, i.e., no communication.

Cloud computing:

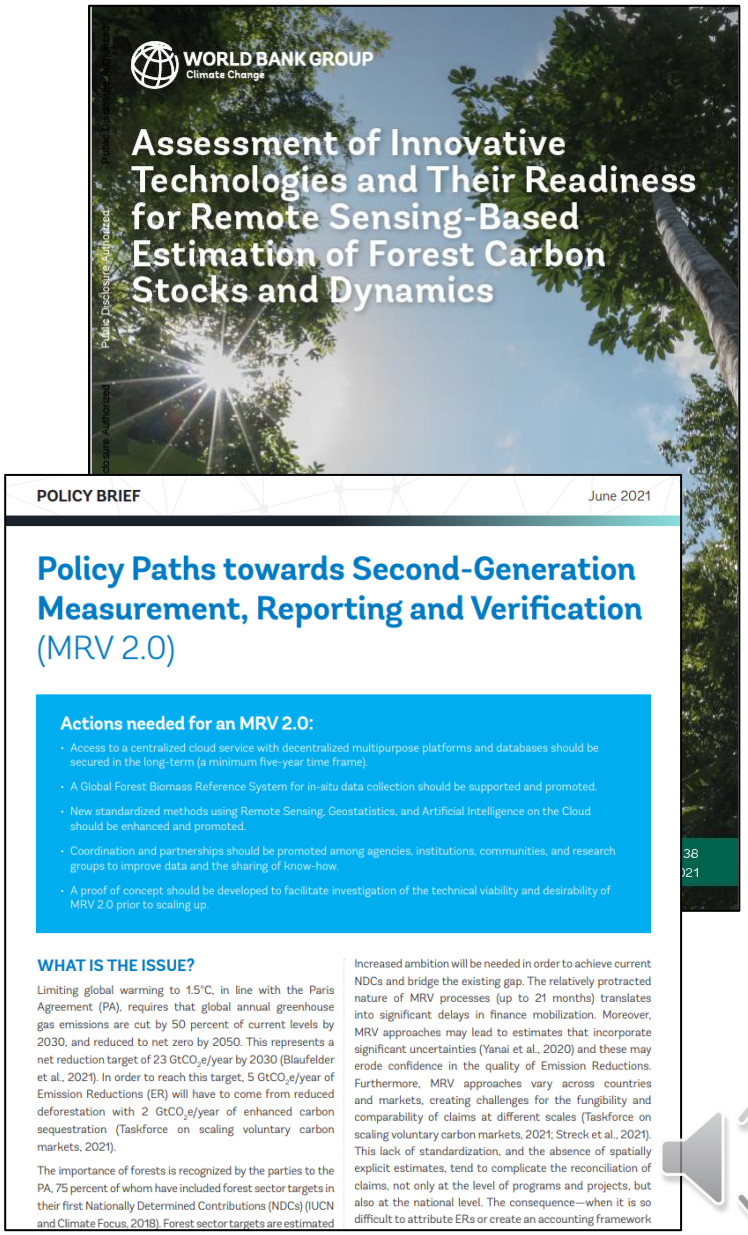
- Status → Cloud computing is a **mature and developed technology**. The only way to have the required processing capability is through CC.
- Gap → **institutional arrangements constrain its use** (e.g., data sharing policies, dependency on providers,…).

Geostatistics (GS):

- Status → **GS represent mature technology** in the forestry domain, but, for the most, have not yet found their way into an operational MRV context
- Gap → Lack of examples scaling-up to national/sub-national scales**, lack of access to in-situ data**, **gap between the GS and RS community**.

How can we get to the solution?

- The report describes **technological challenges, and recommendations** for overcoming them related to five areas:
  - data availability and access;
  - processing and computational performance;
  - uncertainty management;
  - standardization and protocols; and
  - Enabling environments



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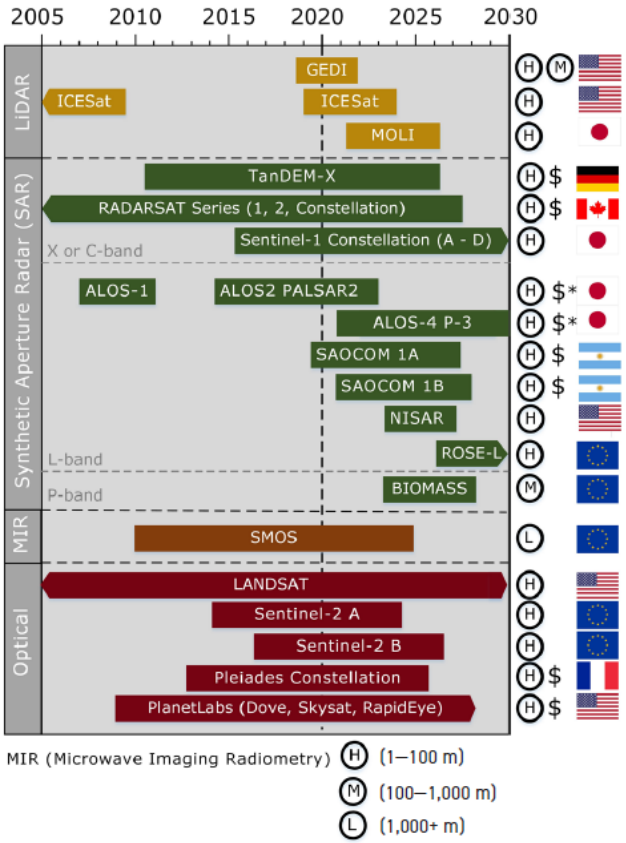
CHALLENGES

The golden age of Remote Sensing, with a plethora of spaceborne sensors, however….



…there are many challenges, but the main challenge to enable an EO-based system is the lack of appropriate high quality *in-situ* data

RECOMMENDATIONS

- **Data availability and access**
  - Seek international partnerships to **facilitate access to data**, i.e., in-situ data, RS data,..
  - Supporting existing efforts in **in-situ data collection** (i.e. Global Forest Biomass Reference).
- **Processing and computational performance**
  - Support the integration of new approaches (i.e. AI, GS) in traditional ones
  - Support the **convergence of techniques between research groups**
  - Build a centralized cloud computing system to enable accessibility, new algorithms,...
- **Uncertainty management**
  - Pilot the implementation of GS / AI through **demonstration activities**
  - Include estimates of error propagation from the input data to the final output in MRV sys
- **Standardization and protocols**
  - Develop standards and protocols for data collection and development of components
  - Promote **data protection and security**.
- **Enabling environments**
  - **Support data policies** (in-situ and RS data): access and sharing.
  - Create incentivization mechanisms for data sharing, communication, etc.
  - Creation of a perceived neutral entity that coordinates these actions (similar to WMO).
  - Establish cross-communication among experts and users.
  - Invest in **research, training, and knowledge transfer**.
  - Create the necessary **financial public and private support** mechanisms
  - Engage stakeholders to build confidence on new approaches

THANK YOU!