

FLINT: A data engine for UNFCCC consistent public *and* private Land Sector MRV?

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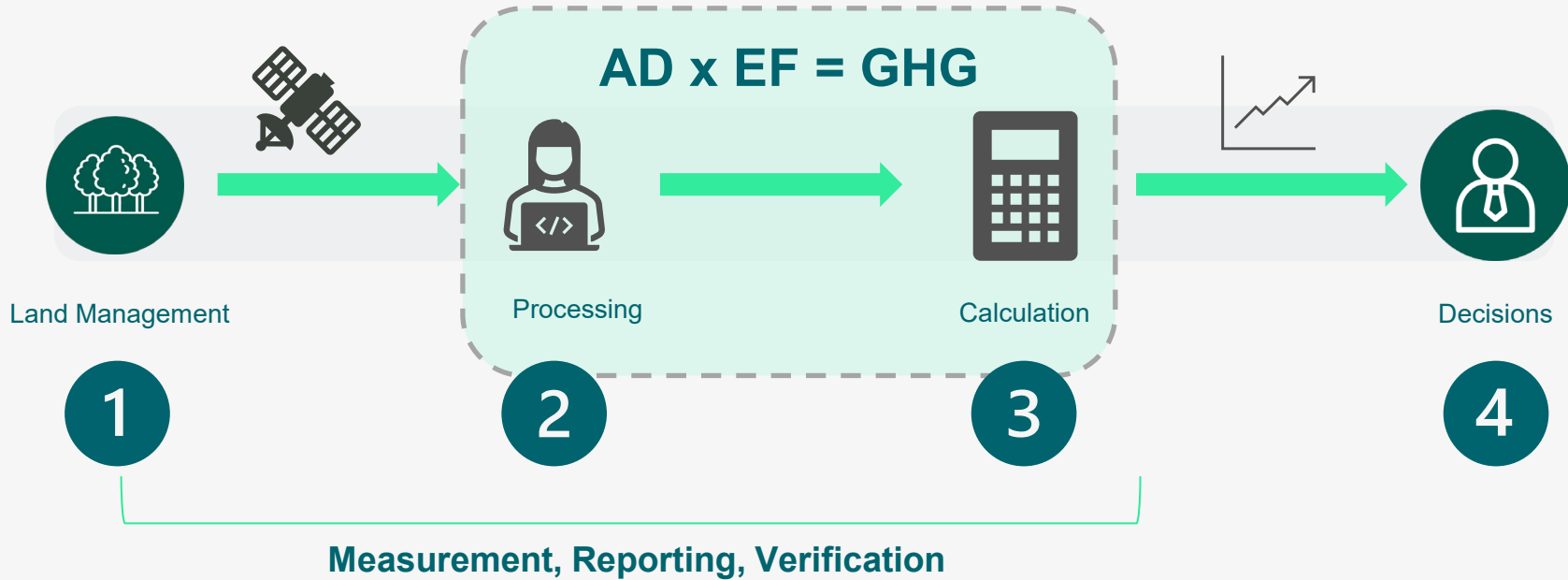




Setting the scene

June 2023

Preparing for decisions...



The Methodology and Data Challenge: Same same, but different (climate impact)



Discretionary,
some incentive



Non-climate Incentives, Schemes, Programmes, Regulation,...



Designated FMUs or areas, e.g., protected habitat, projects



Methodologies?



Other models & tools?



Specific policy objectives



Mandatory, one way, no incentive



LULUCF/Land Sector



All managed land in a country



IPCC Methodologies



Country models & tools



Territorial, target/NDC compliance



Discretionary, indirect incentive



TCFD and other financial sector disclosure frameworks



FMUs owned or financed by financial sector



IPCC or other Methodologies



Freedom of model and tool



Disclosure for ranking and promotion



Voluntary, Incentives underway



Supply Chain/In scope reporting



Specific FMUs depending on exact supply chains



GHG-Protocol or similar methodologies



Service Provider Tools



Global Scope 1-3 reporting



Voluntary, Clear incentives



Compensation market/out-of-scope



Individual plots or FMUs



Standard specific methodologies



Service Provider Tools



Offsetting



FLINT

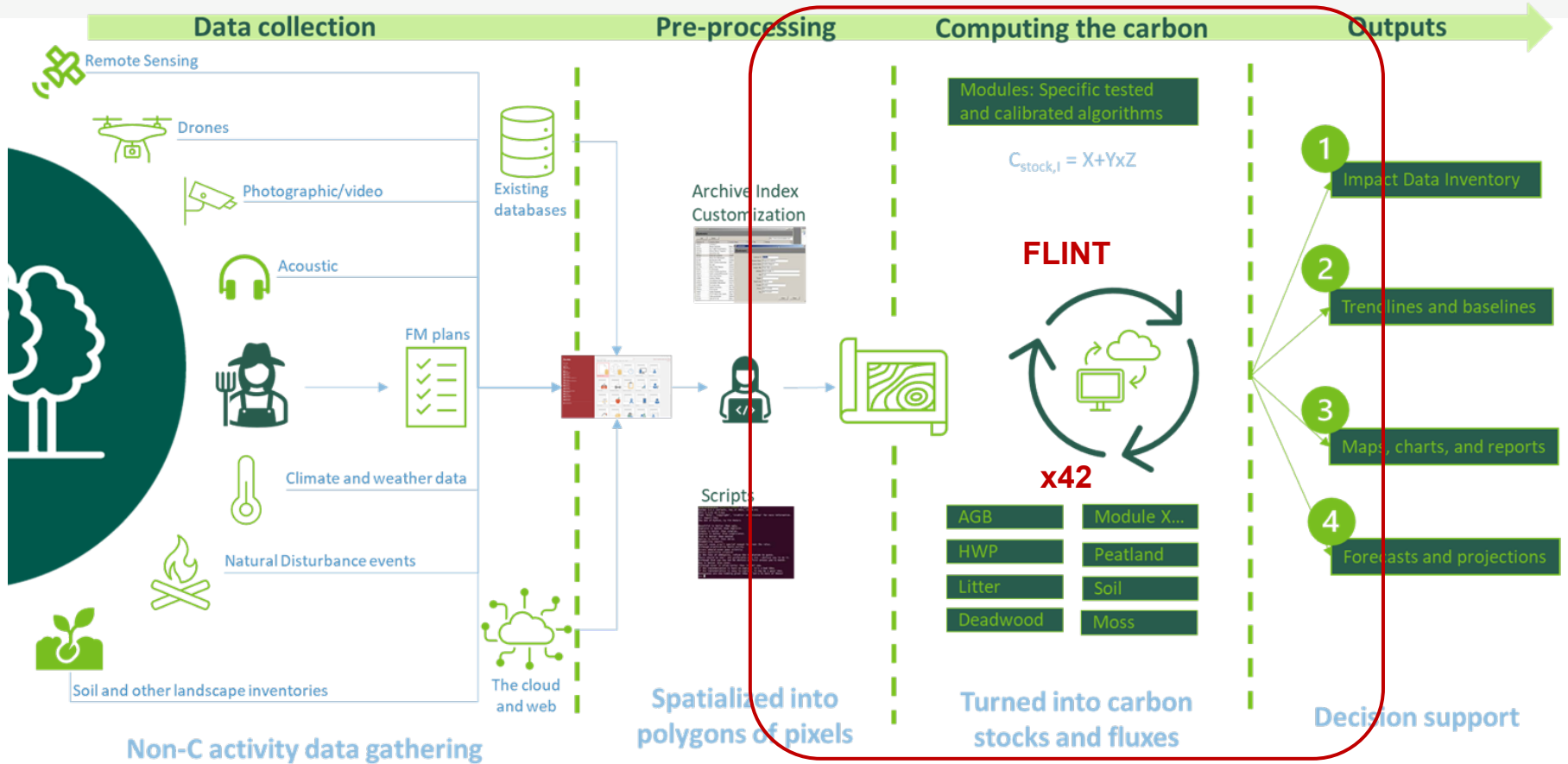


The story of an open-source tool

Forest carbon reporting for (almost) everyone

- The **Full Lands Integration Tool (FLINT)** is an open-source platform for systems designed to generate estimates of land-based carbon stocks, stock changes, emissions and removals.
- Combined with science-based modules that describe carbon dynamics and their drivers, FLINT facilitates the integration of **vast volumes of data for monitoring and projections of alternative scenarios at plot, FMU, regional, national, or global levels.**
- The Generic Carbon Budget Model (GCBM) of the Canadian Forest Service is built on the FLINT platform, incorporating scientific advances of over 20 years.
- Algorithms and core code offered for download via GitHub for free

What is FLINT (for the visual minded)



Key features of FLINT

Integrates data from multiple sources including remote sensing, forest inventories, growth and yield tables or models, activity data on natural disturbances, anthropogenic disturbances and land-use changes, and:

1. Includes **all ecosystem carbon stocks** (not just biomass)
2. Supports **reporting** and monitoring of outcomes of forest management and nature-based climate solution implementations.
3. Supports **projections and decision support** of GHG outcomes of various future mitigation, adaptation and others scenarios
4. **Scale-adaptable** and feedback loop integrated (as foreseen in 2019 Refinement i.e. sub-national level GHG compiling)
5. Enabled for **cloud computing**.

More than **100 years professional development** work behind GCBM/FLINT incl. the below selected publications

- **Analysis of GHG Impacts of Oilsands Development** (Shaw et al. 2021)
- **Projections of mitigation scenarios for BC to 2070** (Smyth et al. 2020)
- **Monitoring of Afforestation Outcomes in Ontario** (Magnus et al. 2021)
- **Forest Carbon Atlas for Canada's National Parks** (Sharma et al. 2023)

CBM-CFS3 - see list of **125 publications** on model science and use in 11 countries: <https://cfs.nrcan.gc.ca/publications?id=40710>



- Moja Global is not a legal entity
- All management work is pro-bono
- Moja Global, coordinating FLINT, hosted by LINUX
- Developed as open source - non-profit since 2015. Code and modules go back decades, linked to GCBM

Open source community

Sponsored mentorship programs

\$180K USD paid to **41 mentees** (2019-2022), globally distributed user base.

Mentorship targeted at **environmental and social good**, including underrepresented groups in tech.

Distributed an additional \$1M USD to support **expert contributions** to open science (e.g. national MRV)

Slack, Github, Youtube

Slack membership growing **120% YOY** (increased 500+ → 1100+ in 2022)

Over **270 Github contributors** with significant activities, 9% increase in returning members (2022).

Extensive Youtube training materials received **4,000+ views** (2020-2022)



THE
LINUX
FOUNDATION



Government
of Canada

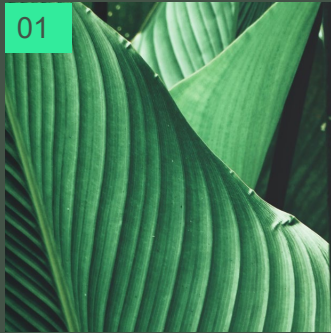


Australian Government



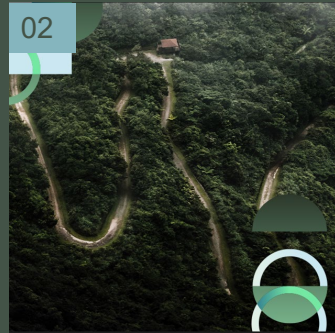
Microsoft

Case Studies



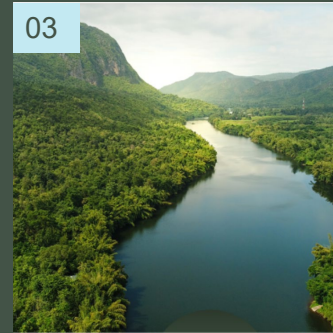
KENYA System for Land-based Emissions Estimation

The FLINT was developed in Kenya as part of the program called System for Land-based Emissions Estimation in Kenya (SLEEK). SLEEK was a Government wide program. The system has been improved in several cycles, including the development of a tool that can generate results in internationally agreed reporting formats and the development of an enteric fermentation model.



CHILE Chile's National Forestry Corporation collaboration

Chile's National Forestry Corporation (CONAF), in collaboration with the Canadian Forest Service and the Mullion Group, is running a pilot project using a FLINT-based system in the Los Rios Region in southern Chile. CONAF is interested to test how available spatially explicit data can be integrated in a transparent and consistent manner.



CANADA Generic Carbon Budget Model

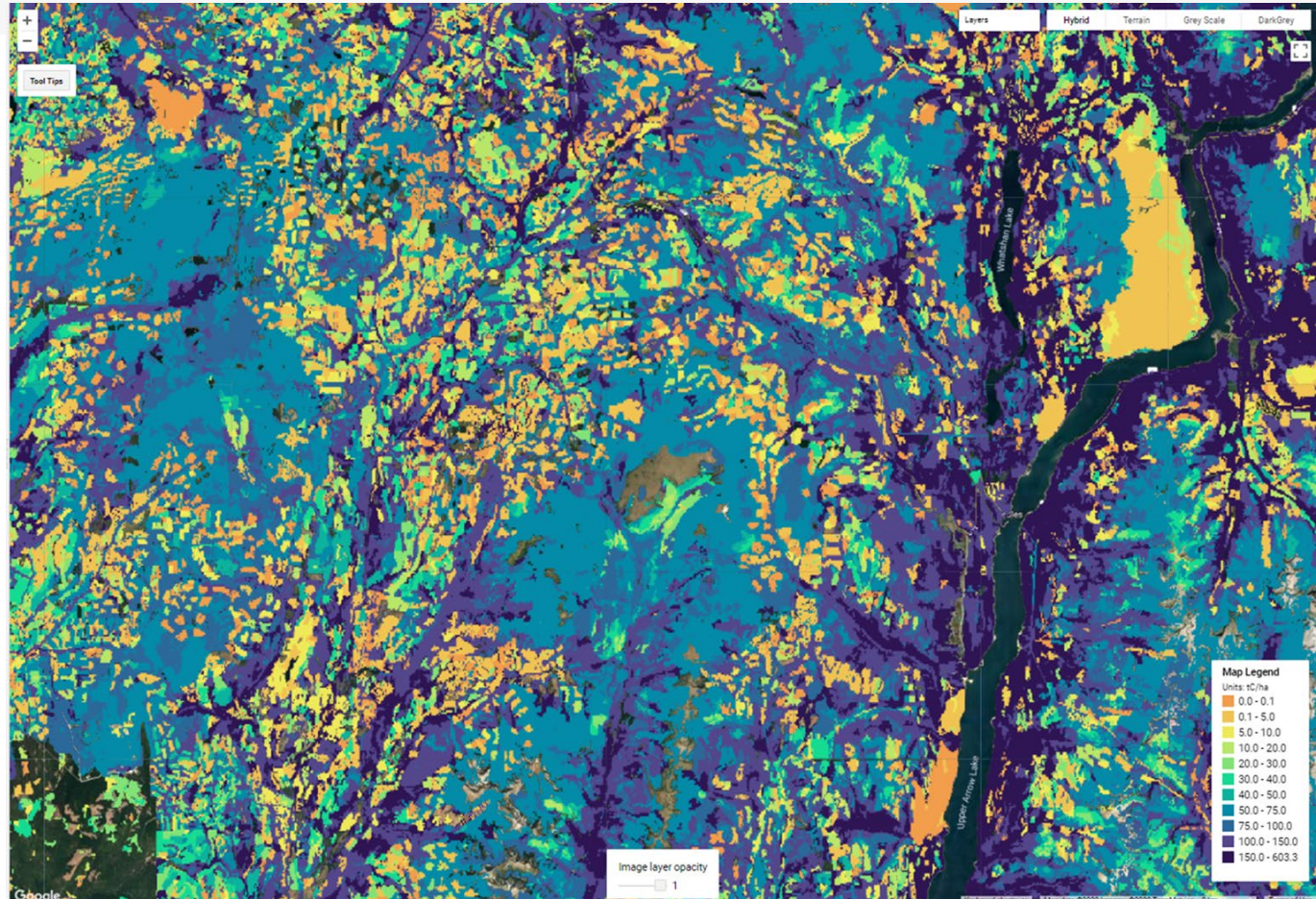
The Canadian Forest Service is one of the most active contributors to moja global. The Generic Carbon Budget Model (GCBM) uses Canadian Forest Service (CFS) science modules on top of the FLINT platform. GCBM has been applied in various projects and at various scales by National and Provincial governments in Canada and in the rest of the world. The Generic Carbon Budget Model (GCBM), Canadian Carbon Budget Model science modules on top of the FLINT platform) has been applied in various projects and at various scales by National and Provincial governments. There is also a keen interest of various companies to start using GCBM.



INDONESIA Indonesian National Carbon Accounting System

Model output - Biomass C stocks per hectare

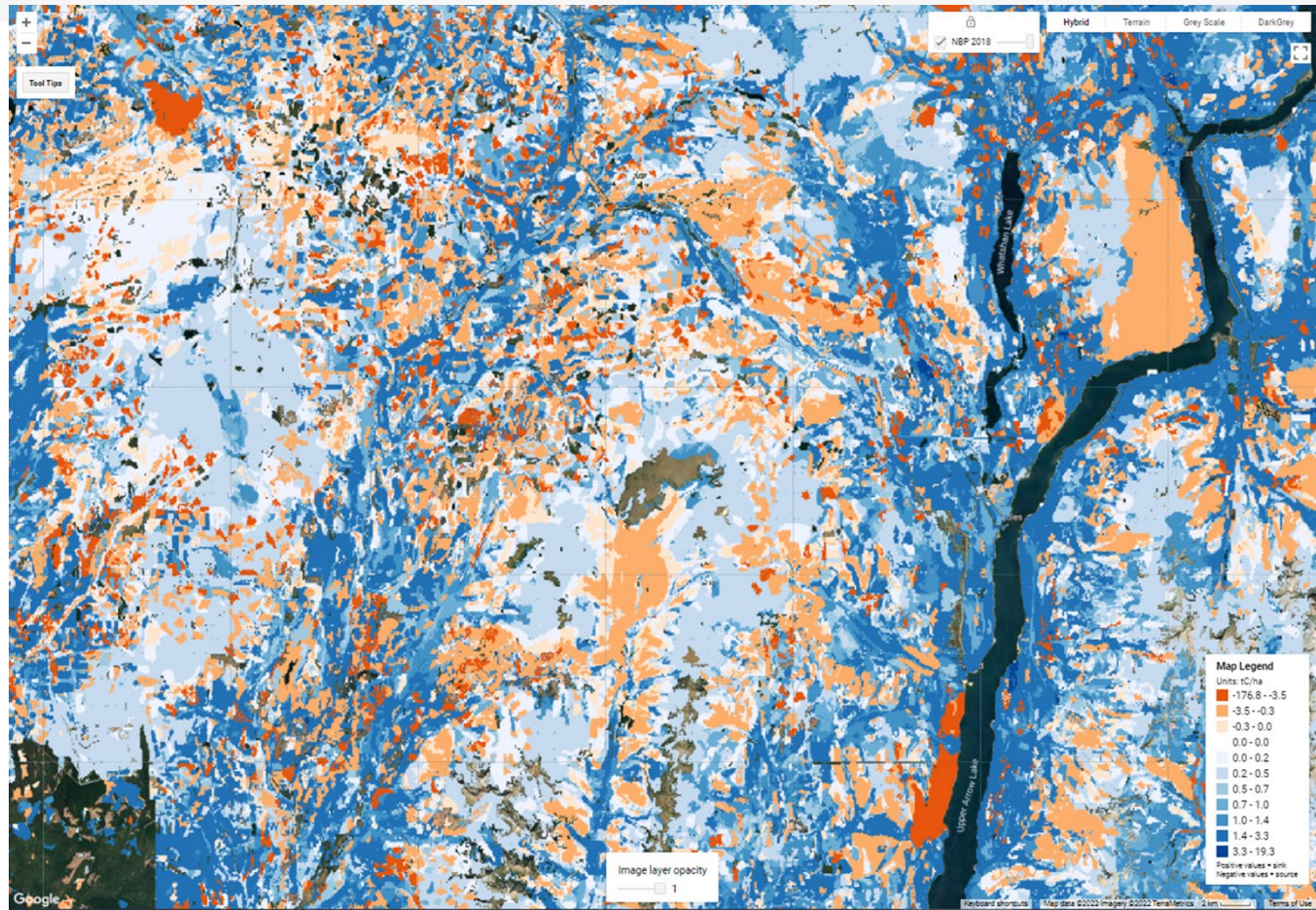
Model output available in annual time steps for many different indicators.



Model output - Net Carbon Balance

Total ecosystem
Carbon balance.

Sources (negative
values) and sinks.

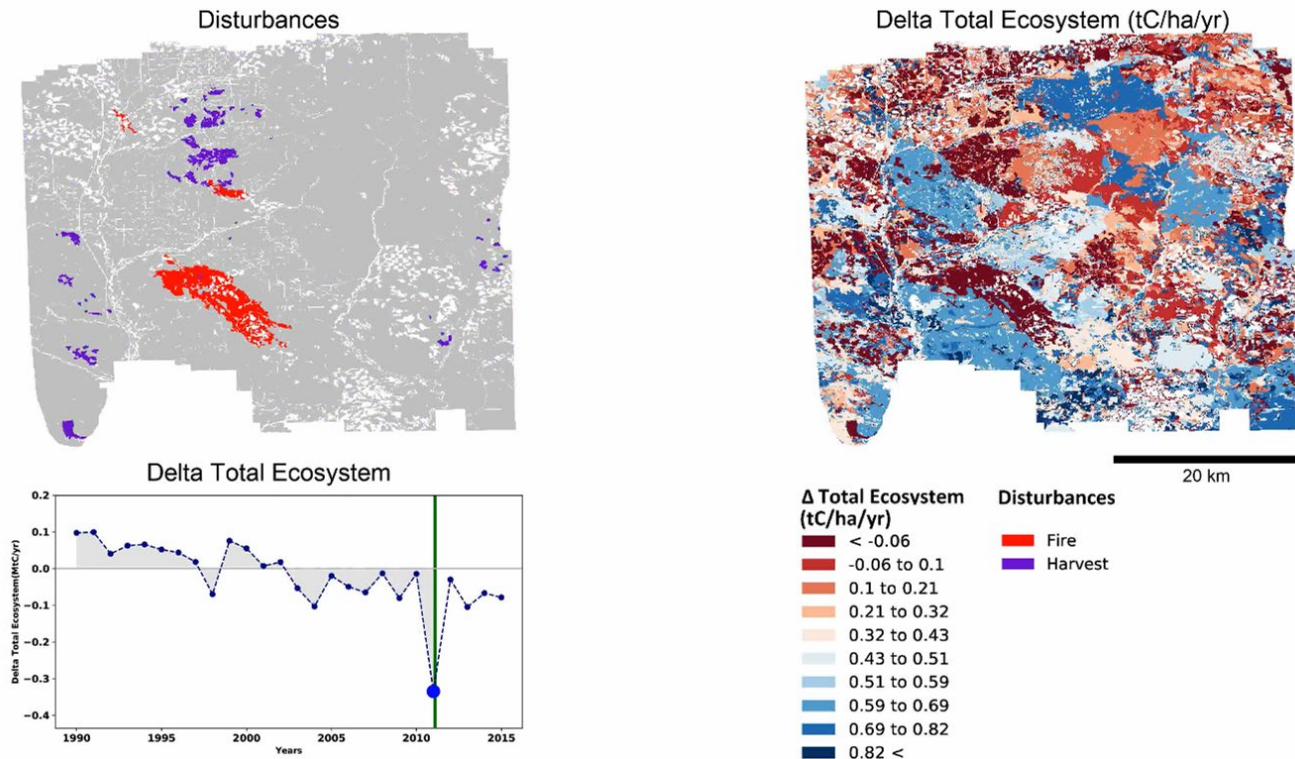


Model output - Net Carbon Balance

Total ecosystem
Carbon balance.

Annual maps of
disturbances (left),
stock changes (right), and
summary (bottom left).

Example: boreal forest.



Canadian Forest Service developing spatially-explicit National Forest Carbon Monitoring, Accounting and Reporting System (NFCMARS) for all managed and unmanaged forests in Canada.

GCBM/FLINT widely used across Canada, including forests and peatlands.

Commitments to ongoing improvements to science e.g.

- climate sensitive growth curves,
- representation of fire severity,
- post-disturbance recovery, and
- projections of outcomes of 2 Billion Tree afforestation outcome.

CFS also continuing to contribute to training and software maintenance.

Demand for FLINT: Public Sector

UNFCCC: Monitoring, Accounting and Reporting Requirements

- National governments required to provide accurate biennial reporting of emissions and removals from all sectors including AFOLU

Climate Action Strategies, Plans and Policies

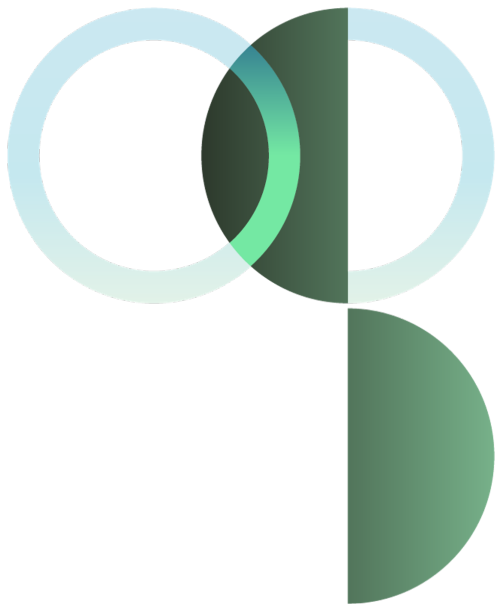
- Locally calibrated decision-support tools are needed to support design and implementation of policy options to achieve climate targets

Carbon Market Policies and Regulation: Jurisdictional REDD+

- Growing demand for tools that can meet the leading standards for jurisdictional (nested) REDD+ crediting, and facilitate benefit sharing and tracking

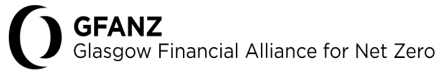
Regulating climate-related risks: Supply Chains and Finance

- New and proposed regulations on deforestation-free commodities. The US and standards bodies will require companies to disclose Scope 1, 2 and 3 emissions, including from AFOLU



Demand for FLINT: Private Sector

Financial Institutions



Commodity Traders



Corporate Climate Targets



Carbon Markets



Lessons learned - open source

1. People are hungry to help - important to have a wide range of projects for scientists, web developers, UI designers, computer scientists, data analysts and technical writers to contribute diverse skill sets.
1. Innovation is organic - most projects have incremental progress, but occasionally new ideas leapfrog and coalesce around new paradigms (e.g. cloud)
1. Docs or it didn't happen - code, results and instructions ***must*** be provided for others to benefit from, else constantly reinventing the wheel.
1. Communities are self-organizing - with many parallel projects, top down coordination is difficult. We instead give guidelines / code-of-conduct and allow members to lead in their own style.

- FLINT meets a need for improved estimates of land-based climate solutions
- FLINT developers combine over 100 years of operational and scientific experience in national and project-level GHG estimation and reporting
- Partnerships will accelerate adoption and further development of FLINT-based analysis and decision support tools.
- Many opportunities to increase usability, lower barriers to entry, advance science to better integrate new remote sensing products.
- The demand for these types of analytical tools is growing rapidly.

An aerial photograph of a lush, dense tropical forest, showing a variety of green and brown tones in the canopy. The image is overlaid with several semi-transparent geometric shapes: a large teal circle on the left, a teal square on the right, and a teal circle at the bottom center. A white corner graphic is visible in the bottom right corner.

Q&A