Geospatial analysis of forest cover change: Main Findings and Next Steps

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REDD+ requires new data on forests

- How much forest is there in Jamaica?
- What types of forest?
- How much carbon is stored in Jamaica's forests?
- How are Jamaica's forests changing?
  - Deforestation
  - Regrowth
- What are the associated CO_2 emissions/removals?

Contents

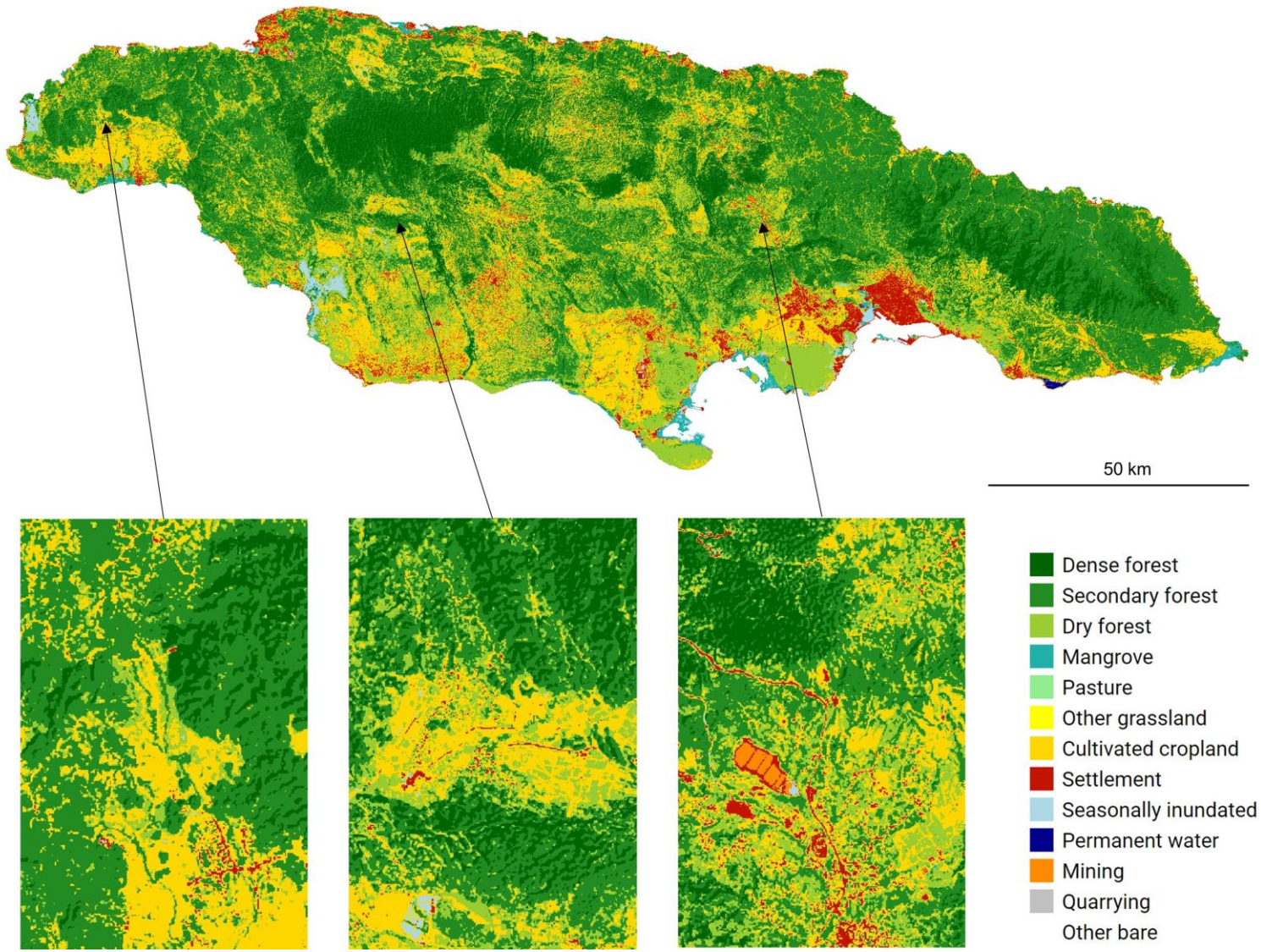
Part 1: The state of Jamaica's forests

- REDD+ readiness (phase 1) has introduced new methods for monitoring Jamaica's forest cover

- These have improved understanding of how and where Jamaica's forests are changing

Land cover time series: methods summary

- Annual maps using Landsat data
  - Unrivalled time series (1984 – present)
  - 30 m pixel resolution
  - Free data
- Annual land cover estimates
- Provides a historical baseline on rates of change and their locations to support a REDD+ strategy.

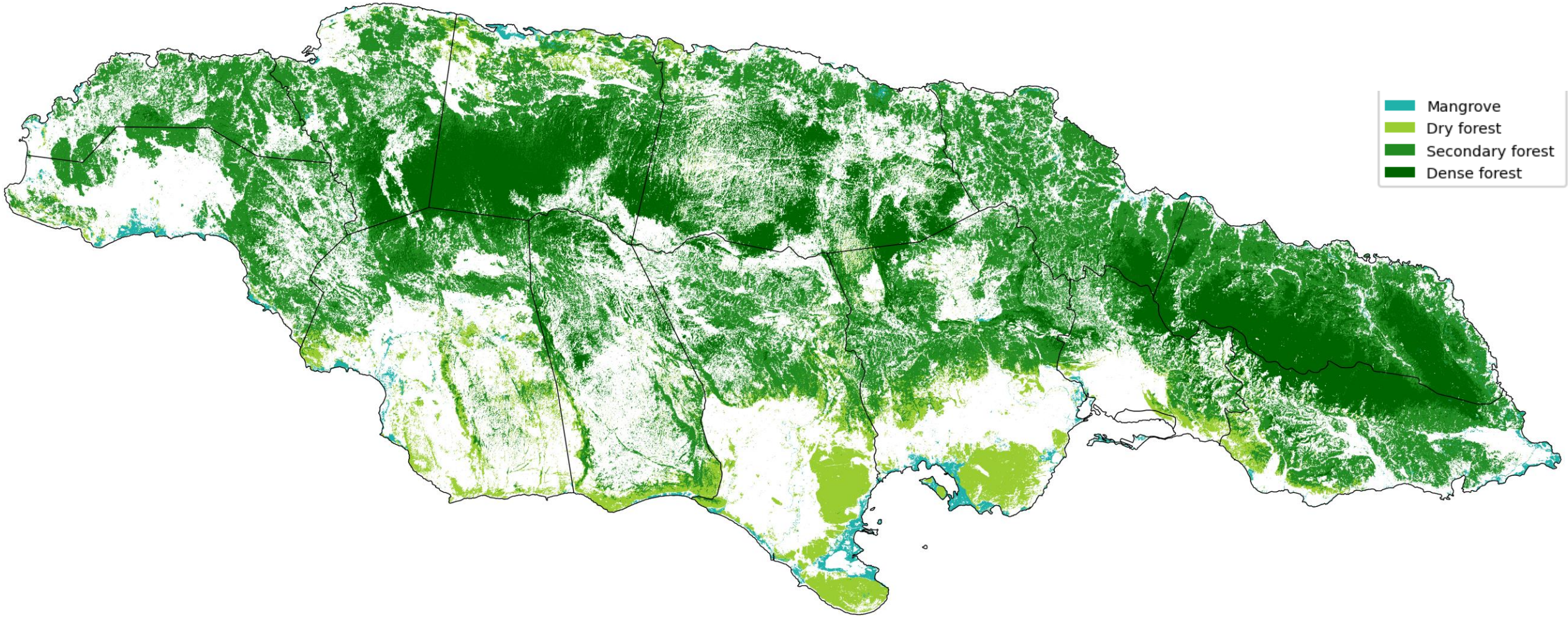


Data available now:

https://sambowers.users.earthengine.app/view/jamaicachangev1
https://sambowers.users.earthengine.app/view/jamaicalandcoverv1

Observation 1: Jamaica is heavily forested

Most tree cover is outside of FD managed lands, and the majority privately owned.
‘Secondary forests’ are dominant



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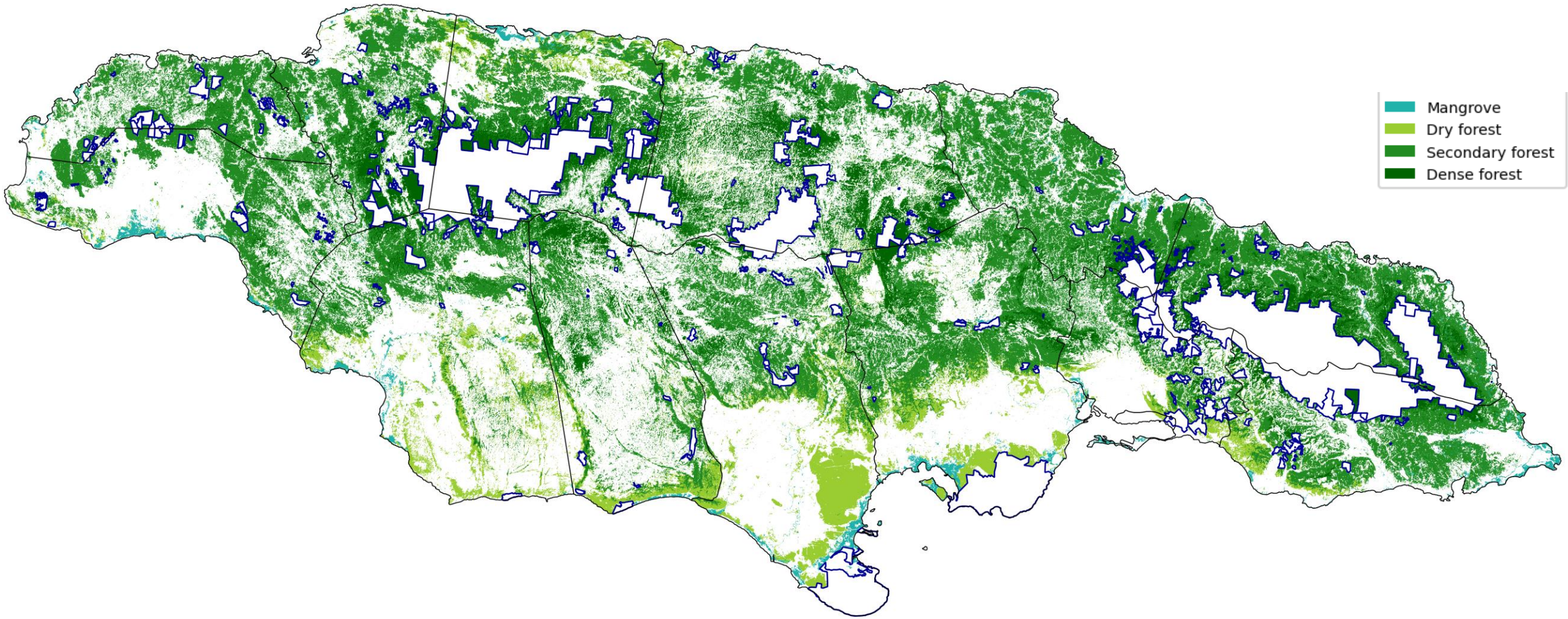
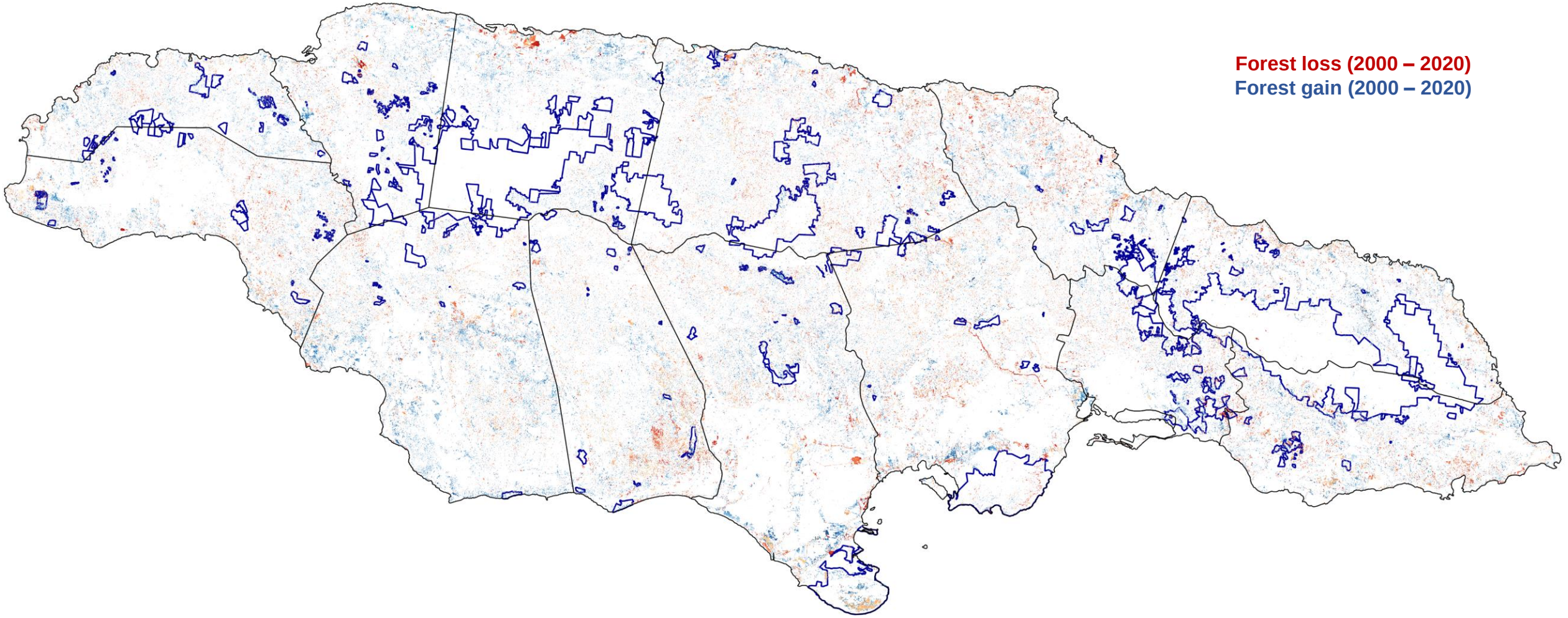
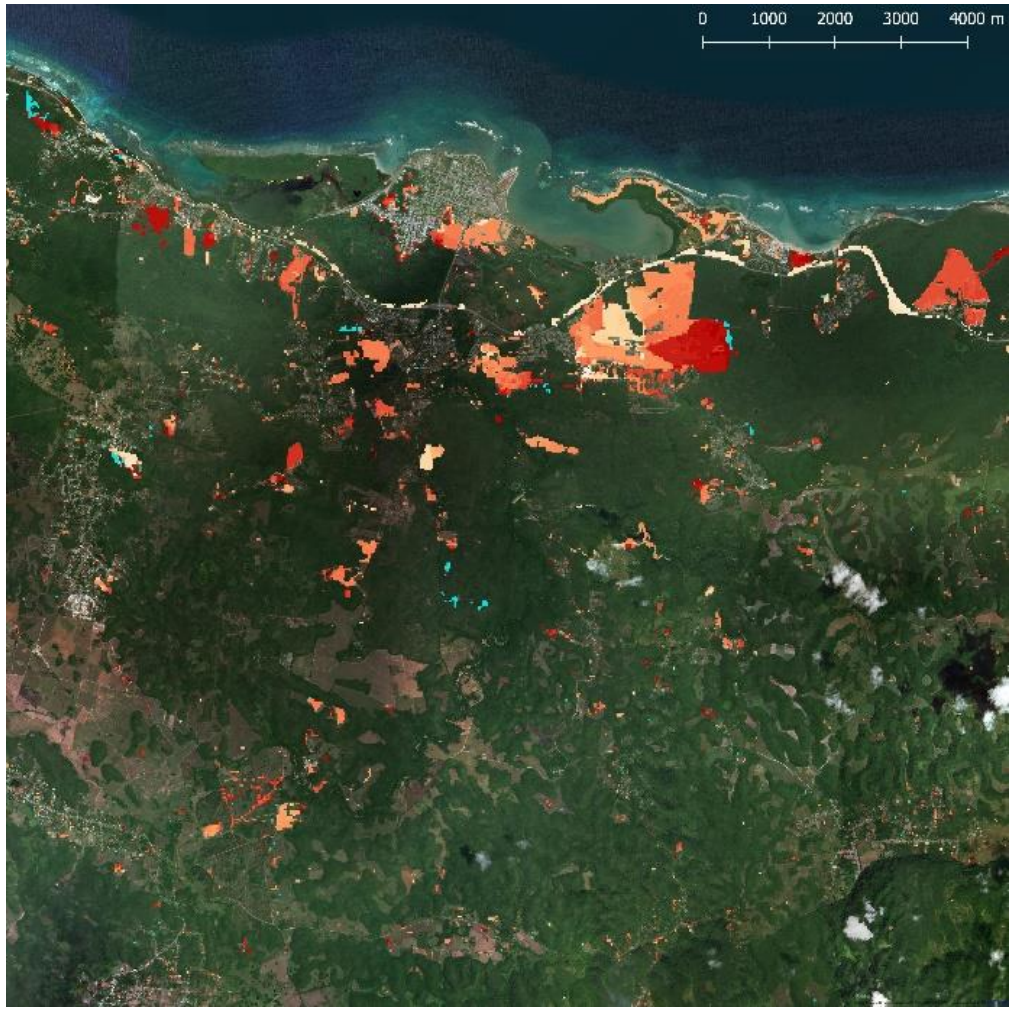


Observation 1: Jamaica is heavily forested

The main changes in tree cover are occurring outside of FD managed land.



Observation 2: There are multiple drivers of change



Settlement expansion. Mainly coastal

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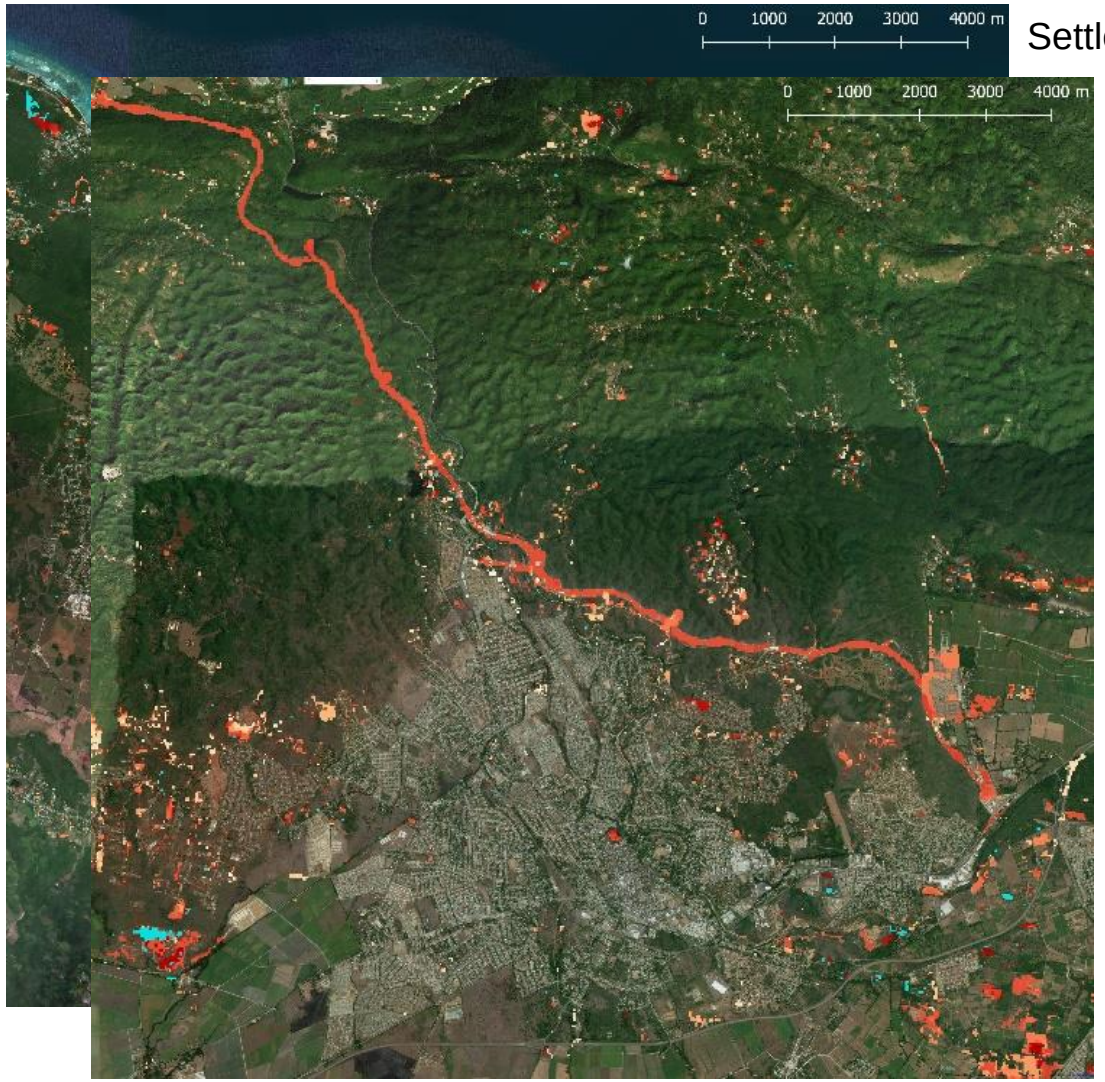
Observation 2: There are multiple drivers of change



Settlement expansion. Mainly coastal

Infrastructure development

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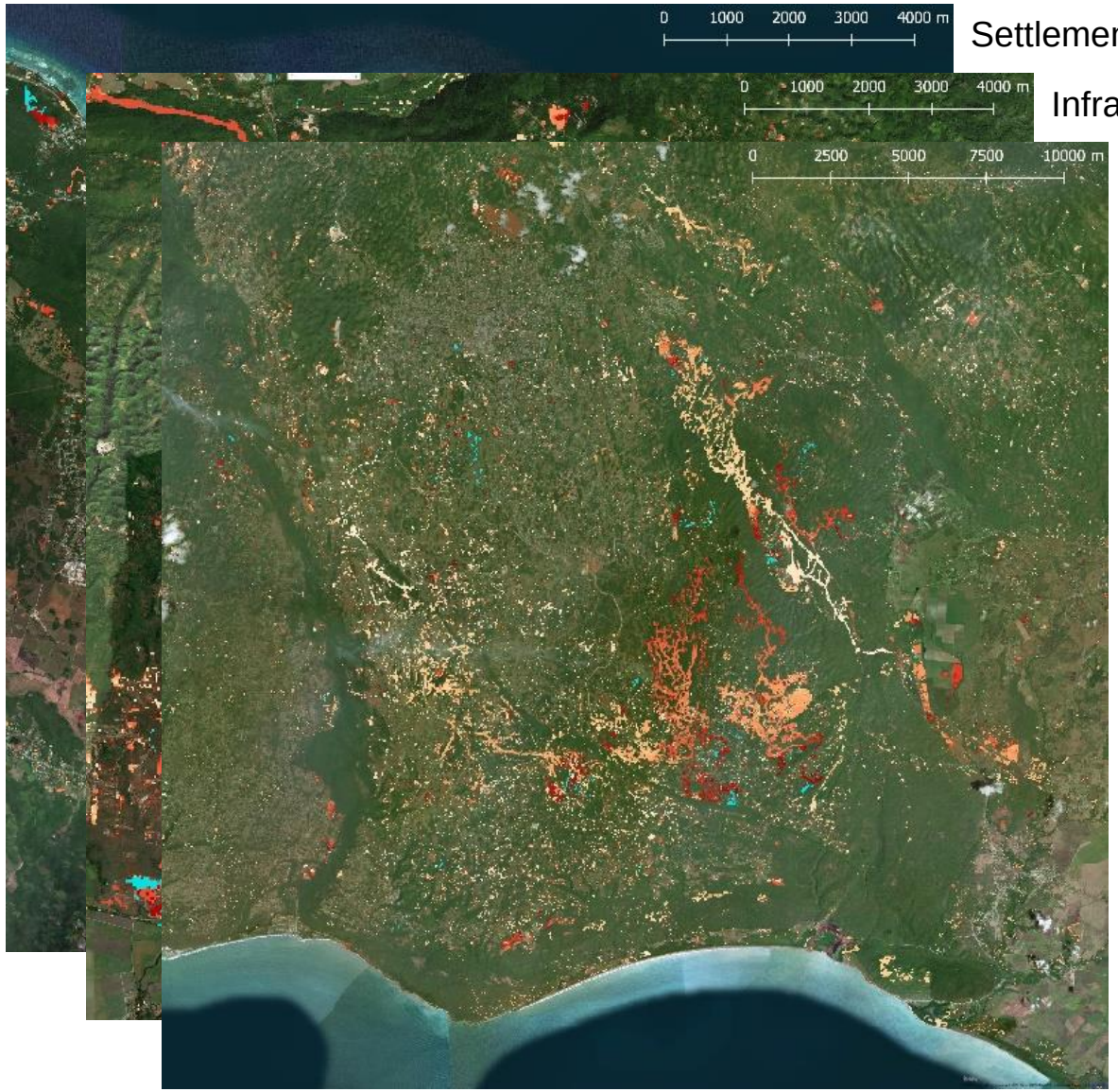

Settlement expansion. Mainly coastal

Infrastructure development

Bauxite mining and quarrying

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Observation 2: There are multiple drivers of change

Settlement expansion. Mainly coastal

Infrastructure development

Bauxite mining and quarrying

Natural disturbances: fire and hurricanes

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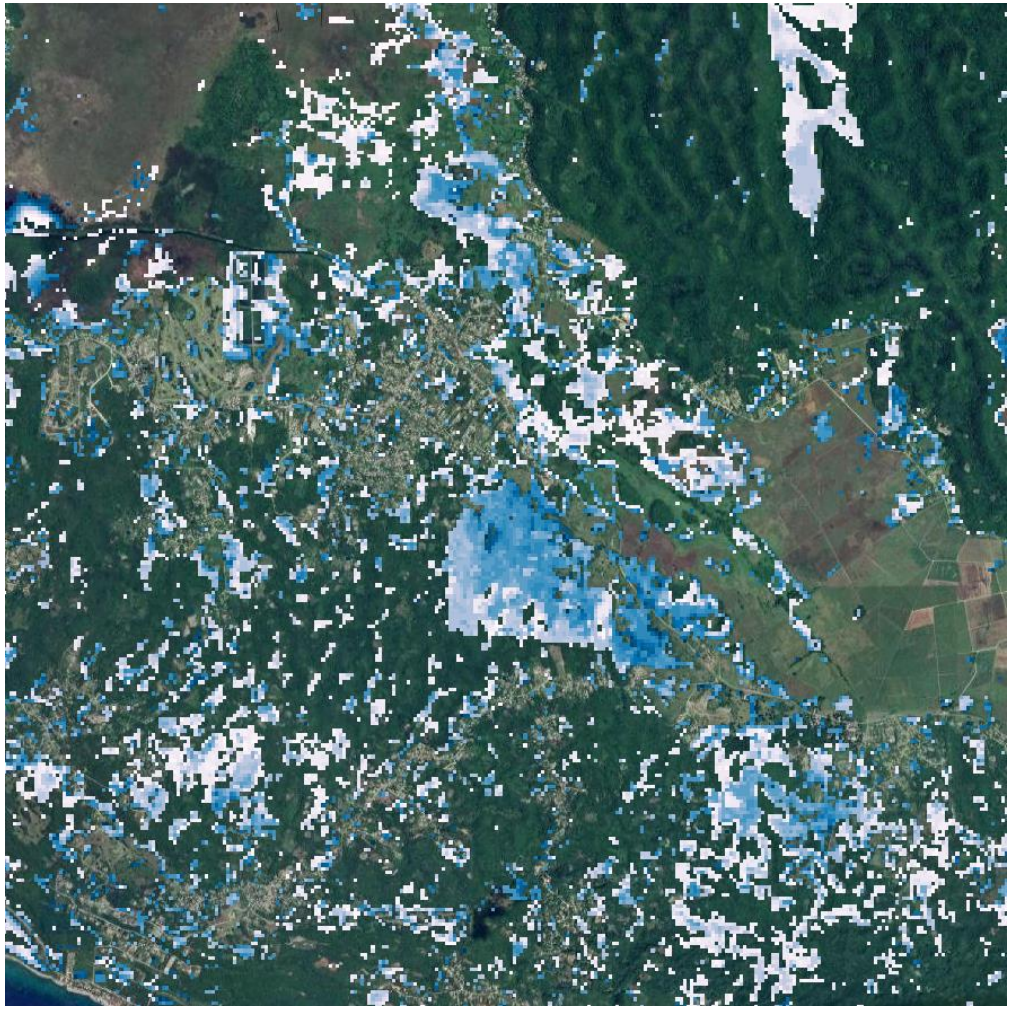
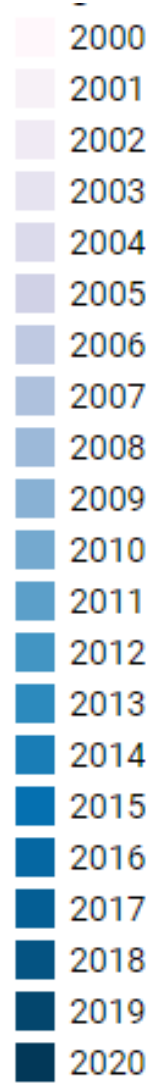
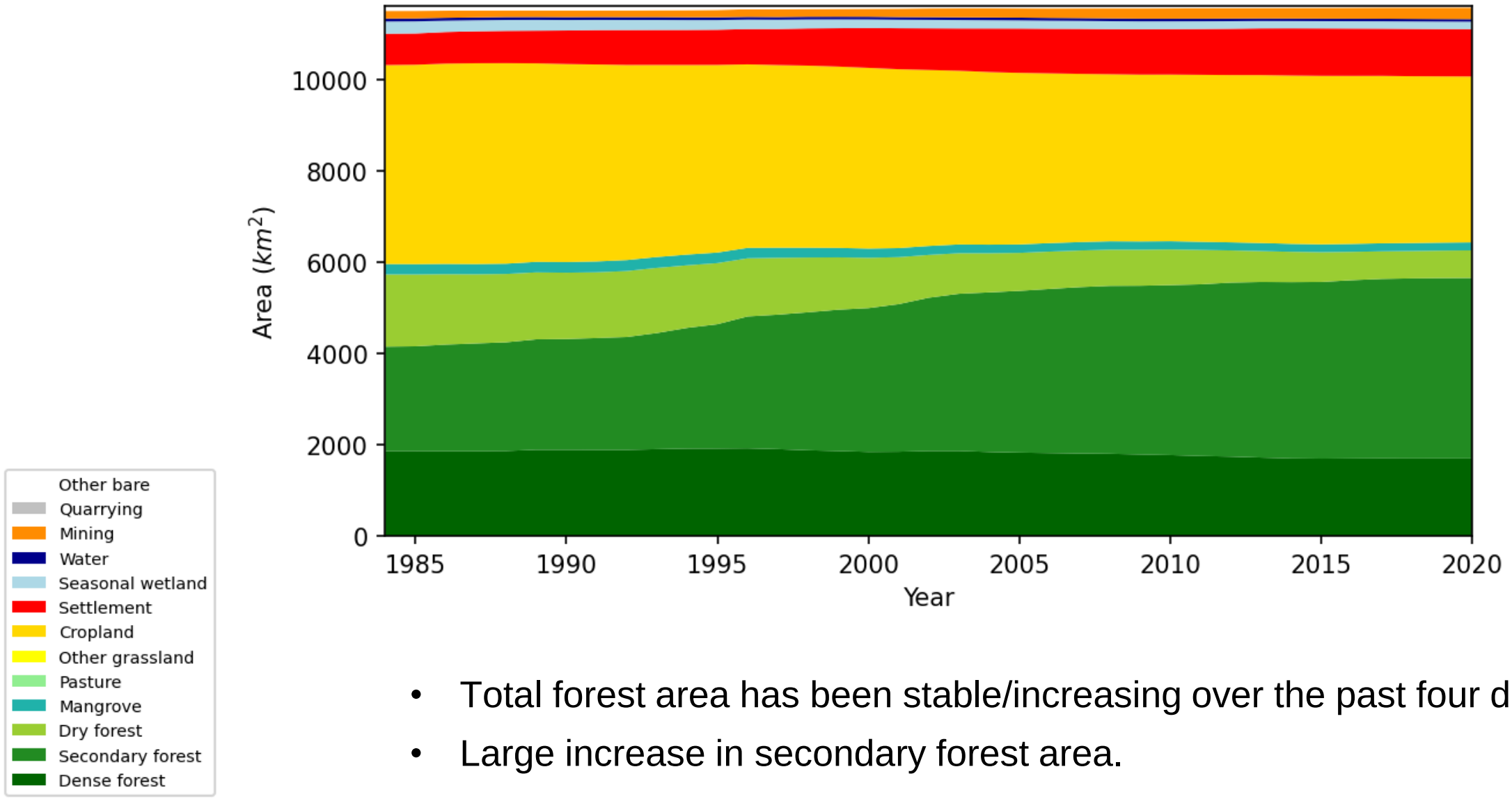


Agriculture (gains)



Observation 3: Net tree cover is likely increasing



- Total forest area has been stable/increasing over the past four decades.
- Large increase in secondary forest area.

This is not the final word

REDD+ is an ongoing process, and new monitoring systems will be developed and formalised over time

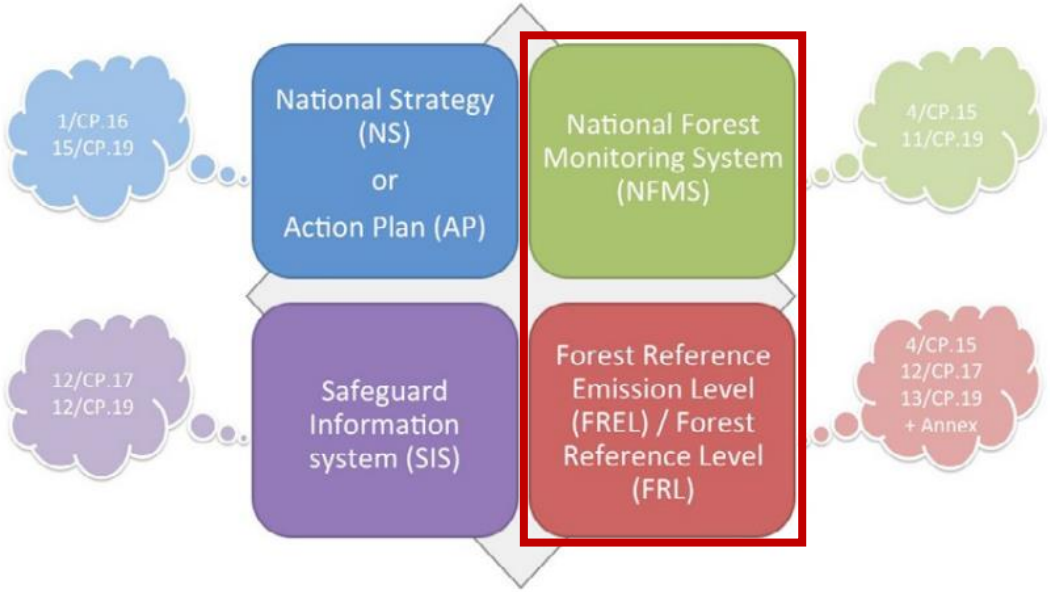
You can expect new data and new opportunities to enhance the strategy.

New data will have multiple applications

- Sustainable forest management
- Jamaica’s NDCs
- Spatial planning

Part 2: The NFMS and FREL

- The Warsaw Framework requires a ‘National Forest Monitoring System’ (NFMS) and a ‘Forest Reference Emissions Level’ (FREL)



Source: UN CC:e-Learn

National Forest Monitoring System

- A National Forest Monitoring System (NFMS) is used for recording and monitoring how land is used in a country, and quantify greenhouse gas emissions.

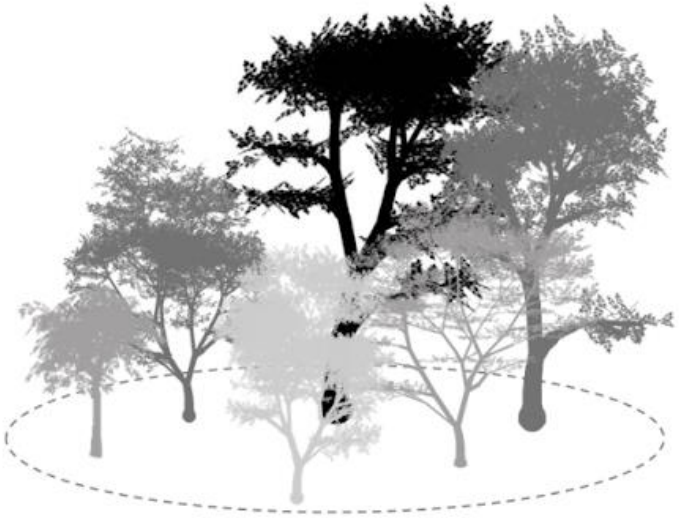
- Implemented in three phases:
  - Phase 1: Gathering initial data, developing capacity, institutions and infrastructure
  - Phase 2: Piloting NFMS with REDD+ demonstration activities
  - Phase 3: Full implementation

- Fulfils the purpose of **Measuring, Reporting and Verification (MRV)**
  - Changes in extent, quality, or type of forest land, usually using satellite data
  - Forest carbon stocks, usually from a national forest inventory

National Forest Monitoring System

Satellite land monitoring system

National Forest Inventory



Greenhouse Gas Emissions

Previous land use	Current land use	Area (ha)	ΔAGB (t/ha)	Emissions (tCO2)
Dry forest	Cropland	700	90	115500
Dry forest	Other land	350	90	57750
Moist forest	Cropland	14700	240	6468000
Moist forest	Grassland	2450	230	1033083
Moist forest	Other land	1400	240	616000
Plantation	Other land	350	290	186083
			Total	8476417

ACTIVITY DATA

Area of forest changes derived from satellite data time series

X

EMISSION FACTORS

Forest carbon density derived from forest plot measurements

=

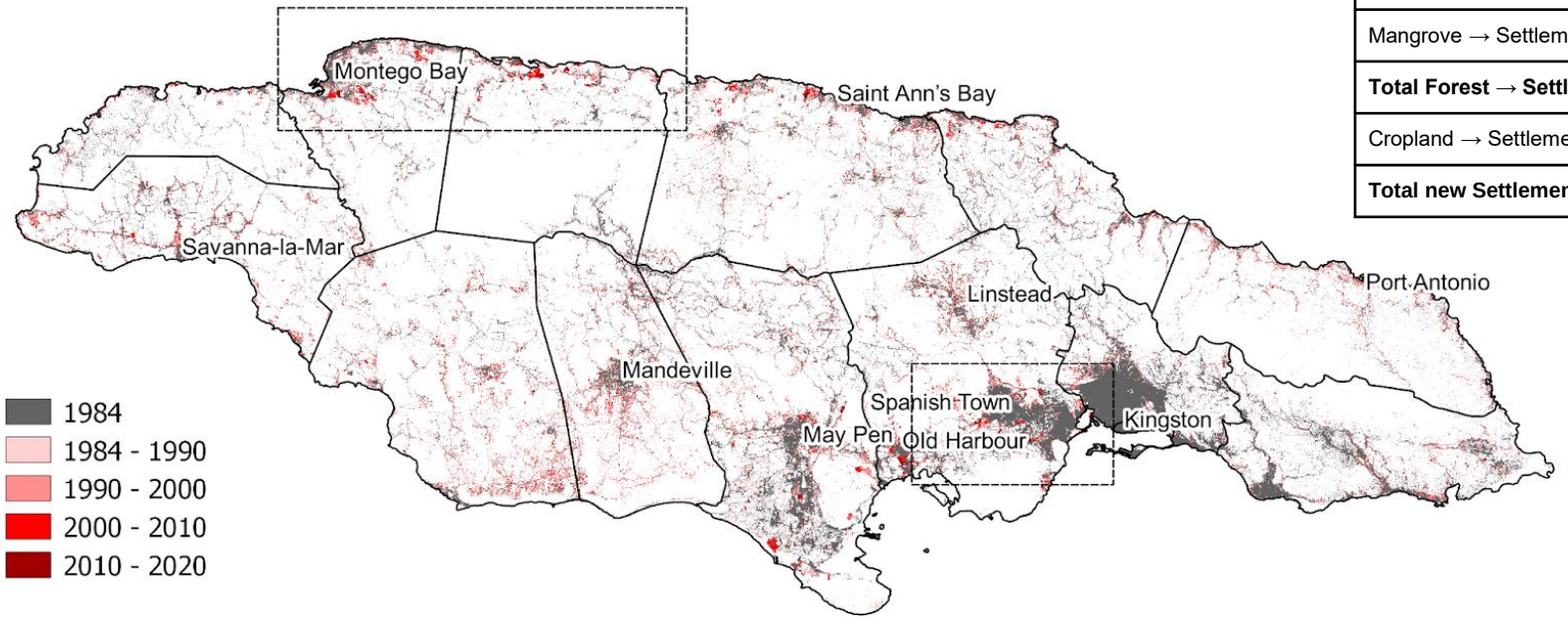
EMISSIONS ESTIMATE

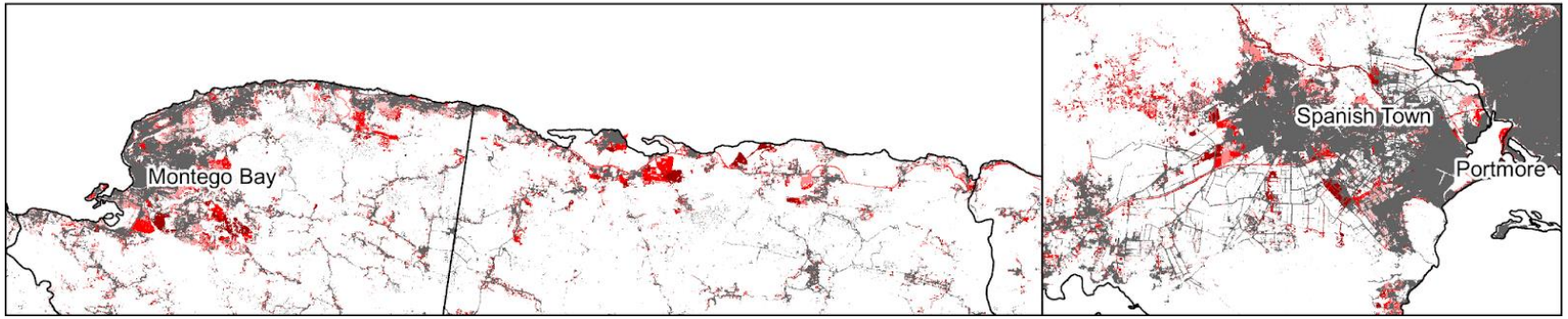
An estimate of greenhouse gas emissions/sinks associated with forestry

National Forest Monitoring System

An example: urban development in Jamaica

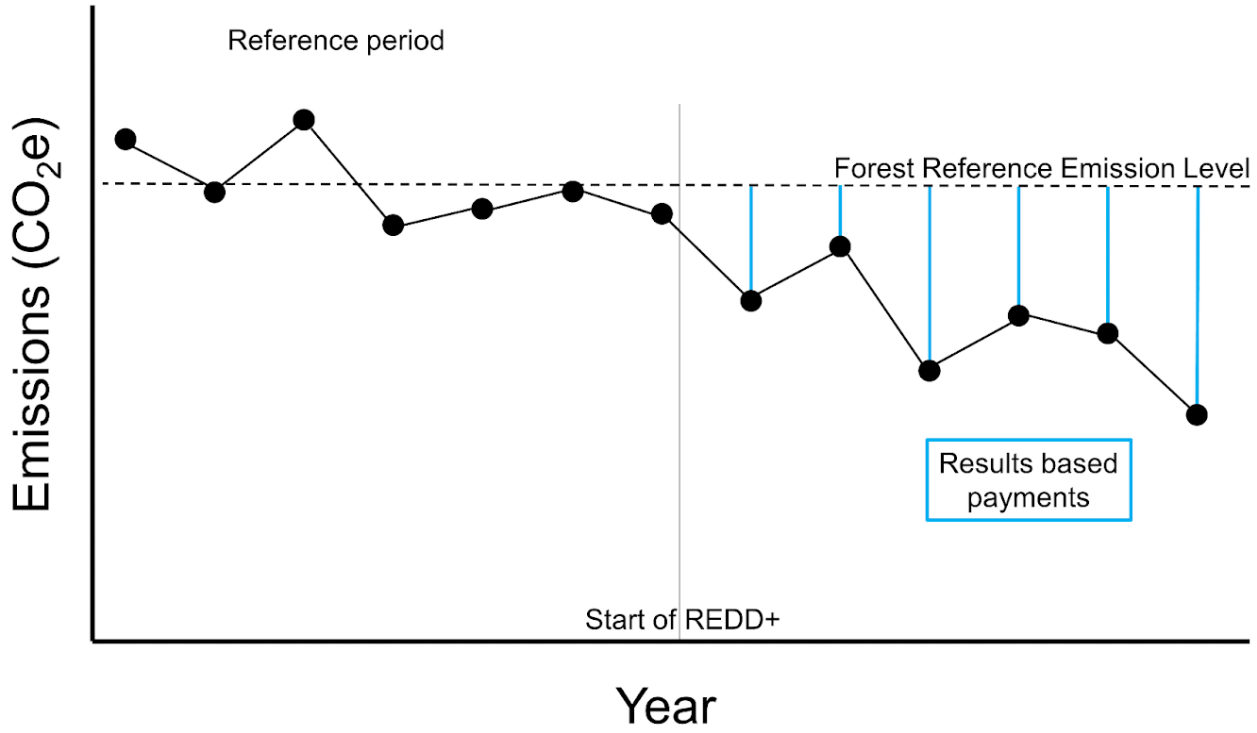
Land conversion	Area 2011 - 2021 (ha/yr)	Forest carbon loss (tonnes/yr)	Emissions (tonnes CO_2/yr)
Dense forest → Settlement	5	1,500	2,585
Secondary forest → Settlement	139	10,703	18,445
Dry forest → Settlement	81	9,720	16,751
Mangrove → Settlement	37	7,104	12,243
Total Forest → Settlement	**262**	**29,027**	**50,023**
Cropland → Settlement	687	-	-
Total new Settlement	**949**	-	-





Forest Reference Emissions Level

- The Forest Reference Emissions Level (FREL) is a benchmark against which to assess performance of REDD+ activities.



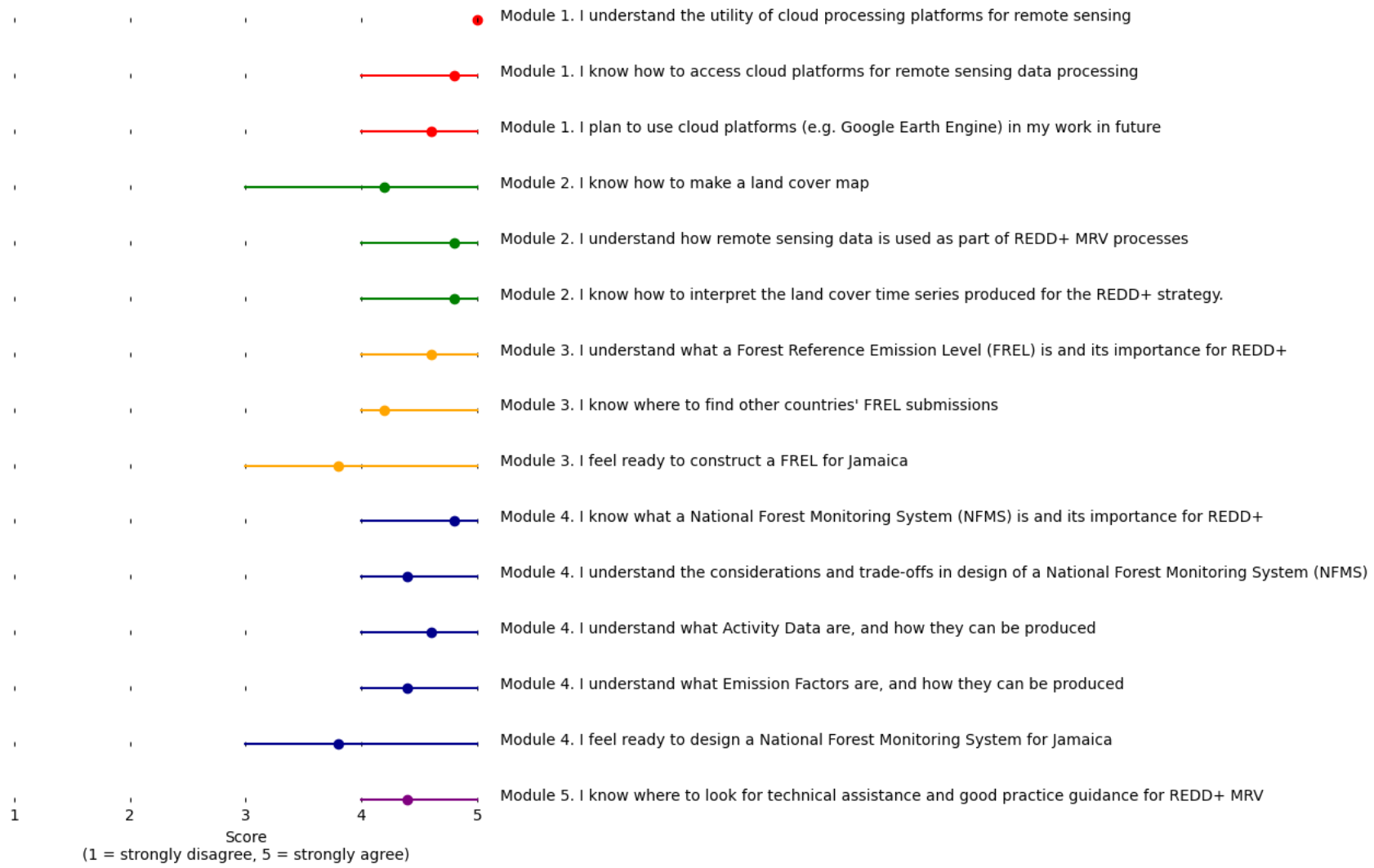
- Once constructed, the proposed FREL can be submitted to UNFCCC. The FREL is subject to technical assessment, and may be revised by the country.

Progress towards a NFMS for Jamaica

Satellite Land Monitoring System	1. A series of remote training workshops have been conducted with geospatial staff in the Forestry Department to familiarize technical staff with the data requirements for a NFMS.
	2. The Forestry Department now has access to a historical time series of forest cover and change at annual time steps. This has been used to identify the activities associated with forest cover change, including both losses and gains.
	3. Methods have been reviewed to produce emissions estimates that are consistent with current best practice for REDD+. The methods eventually used in the NFMS will depend on the chosen REDD+ strategy.
National Forest Inventory	1. Jamaica is currently designing its NFI, and this plan has been reviewed for consistency with the requirements of a NFMS. Broadly it is expected that these data will be suitable for the NFMS, although the 5-year time horizon for completion of the NFI will require use of default emission factors until the NFI is complete.
	2. Training has been conducted with field staff on the data requirements of an NFMS, including methods for production of emission factors.

National Forest Monitoring System

MRV Training



Date	Content
Module 1. Cloud processing platforms	
13th October 2020 9:00 – 11:30 am	Introduction to cloud platforms for EO data processing
20th October 2020 9:00 – 11:30 am	Introduction to Google Earth Engine
27th October 2020 9:00 – 11:30 am	Introduction to Google Earth Engine continued
3rd November 2020 9:00 – 11:30 am	Global Forest Change data in Google Earth Engine
Module 2. Land cover mapping	
10th November 2020 9:00 – 11:30 am	Key concepts
17th November 2020 9:00 – 11:30 am	Land cover mapping in Google Earth Engine
24th November 2020 9:00 – 11.30 am	Group A: Training data collection Group B: Catch-up
1st December 2020 9:00 – 11.30 am	Group A: Training data collection continued Group B: Catch-up
8th December 2020 9:00 – 11:30 am	Methods for time series mapping
15th December 2020 9.00 – 11.30 am	Open session
Module 3. Forest Reference Emission Levels	
19th January 2021 9.00 – 11.00 am	Introduction to REDD+
26th January 2021 9.00 – 11.00 am	Activity data: pixel counting
2nd February 2021 9.00 – 11.00 am	Activity data: systematic sampling
9th February 2021 9.00 – 11.00 am	Webinar: Collect Earth
16th February 2021 9.00 – 11.00 am	Activity data: stratified sampling
23rd February 2021 9.00 – 11.00 am	Activity data: Stratified area estimation
2nd March 2021 9.00 – 11.00 am	Review of drivers of deforestation in Jamaica
9th March 2021 9.00 – 11.00 am	Review: Other countries FREL submissions
Module 4. National Forest Monitoring Systems	
4th May 2021 9.00 - 11.00 am	A NFMS roadmap for Jamaica
11th May 2021 9.00 - 11.00 am	GOFC-GOLD World Bank training module: Estimating emission factors for forest cover change
18th May 2021 9.00 - 11.00 am	GOFC-GOLD World Bank training module: Estimation of carbon emissions
25th May 2021 9.00 - 11.00 am	GOFC-GOLD World Bank training module: Estimation of uncertainties

NFI Training

10th – 11th November 2021, Terra Nova Hotel

Day	Description
Day 1 am	Introduction to REDD+ ● National Forest Monitoring Systems ● Emission factors and activity data ● Forest Reference Emission Levels ● Jamaica's REDD+ strategy Estimating emission factors: ● What is the purpose of a National Forest Inventory (NFI)? ● How can an NFI inform REDD+? ● Plot inventory methods ● Allometric models ● Uncertainty Practical: Estimating emission factors using forest inventory data analysis in Excel
Day 1 pm	Counting carbon 1 ● What is activity data, and how is it estimated? Practical: Review of historical forest change data in Jamaica
Day 2 am	Counting carbon 2 ● How are emissions estimated for REDD+? ● What data will Jamaica need? ● How will Jamaica generate a FREL? Practical: Emissions estimation methods in Excel
Day 2 pm	Practical: Open session, Select from: ● Emissions estimation methods in Excel continued ● Review some real emissions estimates, including methods for estimating uncertainties ● Introduction to programming in R REDD+: The international context ● Who funds REDD+? Quiz: Assessment of learning.

Part 3: What comes next?

Two central goals:

1) Operationalisation of the NFMS

2) Submission of the FREL

Operationalising the NFMS and FREL

Requirements:

- Research and development
- Training and learning
- Dedicated staff time
- Field testing
- Funding

Outcomes:

- Finalised methods for forest monitoring
- Standard Operating Procedures
- A proposed FREL for Jamaica

Anticipated challenges:

- What is the scope of REDD+?

Deforestation, degradation, conservation, sustainable forest management, enhancement

- What is a forest?

Is 70% canopy cover a workable forest definition?

- Idle agricultural land – forest or not?

Is Jamaica's forest cover really increasing?

- Complex land tenure

Forest changes are concentrated on private land

- Demonstrating additionality

How can it be determined whether actions are adding to forest protection in Jamaica?

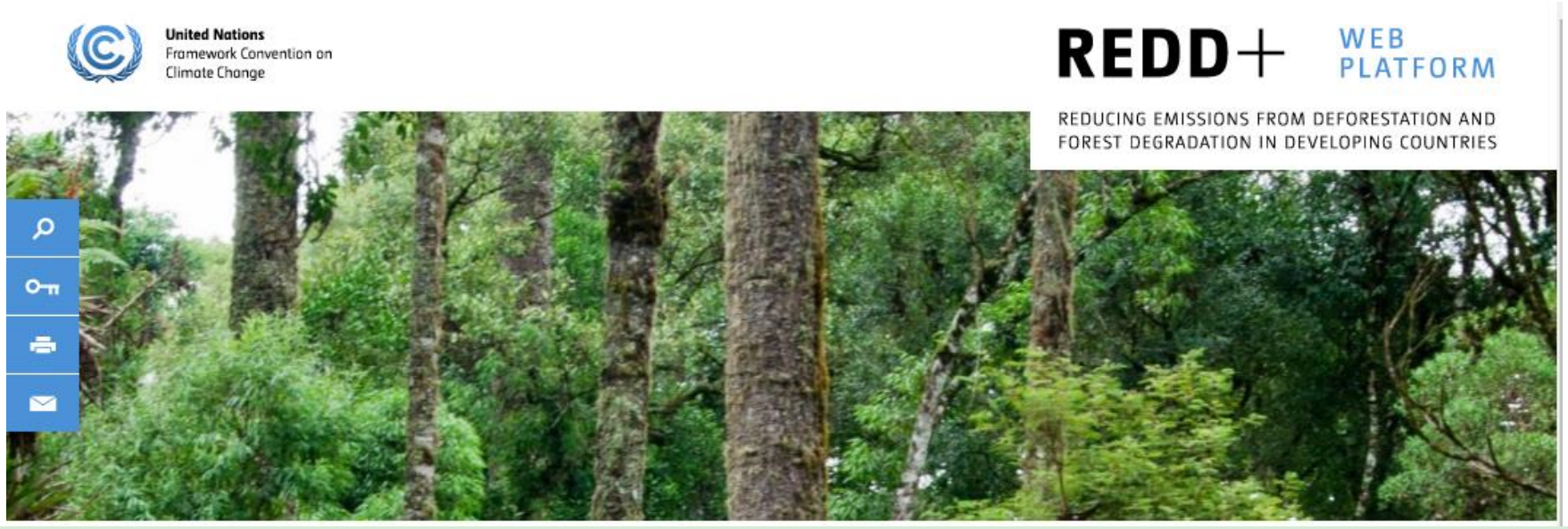
- Consistency with other programs

Nationally determined contributions, FAO FRA, Forest reserve management

N.B These decisions are as much strategic as technical

Submitting the FREL

https://redd.unfccc.int/fact-sheets/forest-reference-emission-levels.html



Countries that submitted a proposed forest reference emission level and/or forest reference level

Argentina	Dominican Republic	Lao People's Democratic Republic	Papua New Guinea
Bangladesh	Ecuador	Liberia	Paraguay
Belize	El Salvador	Madagascar	Peru
Bhutan	Equatorial Guinea	Malawi	Saint Lucia
Brazil	Ethiopia	Malaysia	Solomon Islands
Burkina Faso	Gabon	Mexico	Sri Lanka
Cambodia	Ghana	Mongolia	Sudan
Chile	Guatemala	Mozambique	Suriname
Colombia	Guinea-Bissau	Myanmar	Thailand
Congo	Guyana	Nepal	Togo
Costa Rica	Honduras	Nicaragua	Uganda
Côte d'Ivoire	India	Nigeria	United Republic of Tanzania
Democratic Republic of the Congo	Indonesia	Pakistan	Viet Nam
Dominica	Kenya	Panama	Zambia

Submitting the FREL

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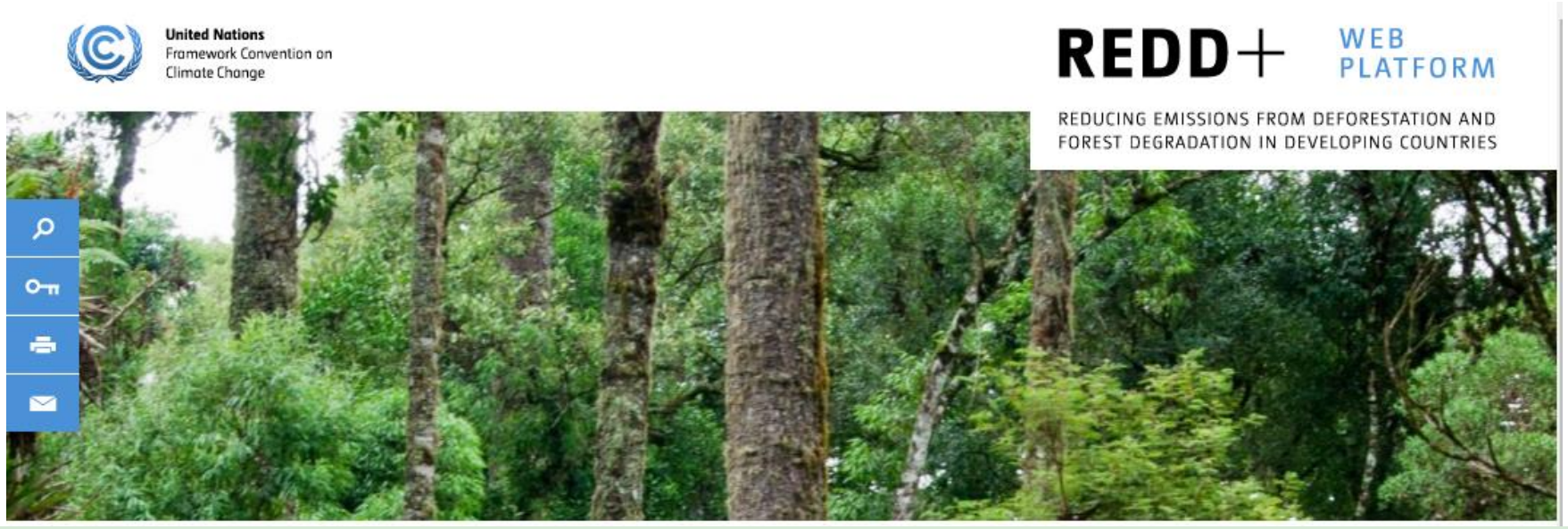

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Cambodia
Chile
Colombia
Congo
Costa Rica
Côte d'Ivoire
Democratic Republic of the Congo
Dominica
Dominican Republic
Ecuador
El Salvador
Equatorial Guinea
Ethiopia
Gabon
Ghana
Guatemala
Guinea-Bissau
Guyana
Honduras
India
Indonesia
Kenya
Lao People's Democratic Republic
Liberia
Madagascar
Malawi
Malaysia
Mexico
Mongolia
Mozambique
Myanmar
Nepal
Nicaragua
Nigeria
Pakistan
Panama
Papua New Guinea
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Peru
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