EO 4 Ecosystem Accounting 2022

New Approach for Mapping Ecosystem Extent based on Land Cover Mapping and Ecosystem Modelling: A Pilot Study in Liberia

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et al.

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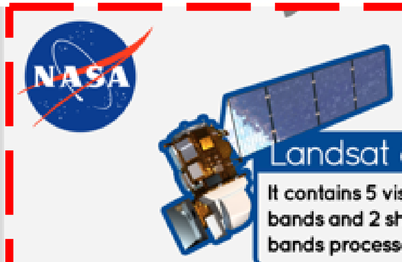
Study Site

Liberia

The CI-NASA Partnership Approach



Landsat 8 SR collection

It contains 5 visible and near-infrared (VNIR) bands and 2 short-wave infrared (SWIR) bands processed to surface reflectance.

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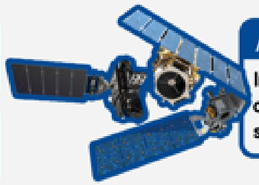
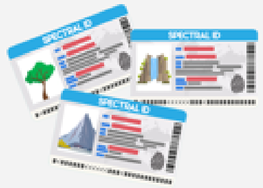


Ancillary datasets

In addition to the Landsat 8 imagery, several additional geospatial datasets were used as support in mapping and validation.

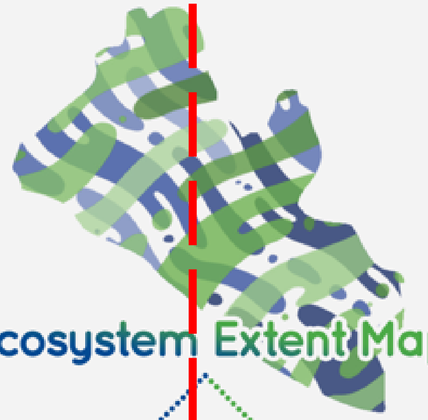
Random Forest

Random Forest is a well-known classification method and its robustness (compared to other well established methods such as Decision Trees and Support Vector Machines) has been proven and confirmed over the years.



Land use/ land cover map

Classified map of land use/ land cover created using a semi-automated methodology and the random forest classification model.



Ecosystem Extent Map

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Species distribution data

Plant species occurrence data from the Botanical Information and Ecology Network (BIEN) plant dataset.

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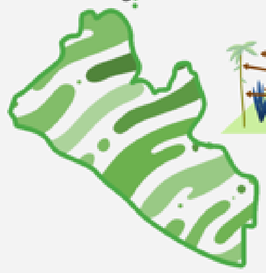
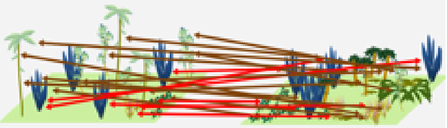
Biogeophysical data

Examples of biogeophysical data that are used as inputs are: rainfall and temperature, soil and topography.

Generalized Dissimilarity Model

GDM is a statistical technique for modelling compositional dissimilarity (or difference). It is used to predict compositional dissimilarity using species data and environmental variables regardless of whether biological data is available for all locations.

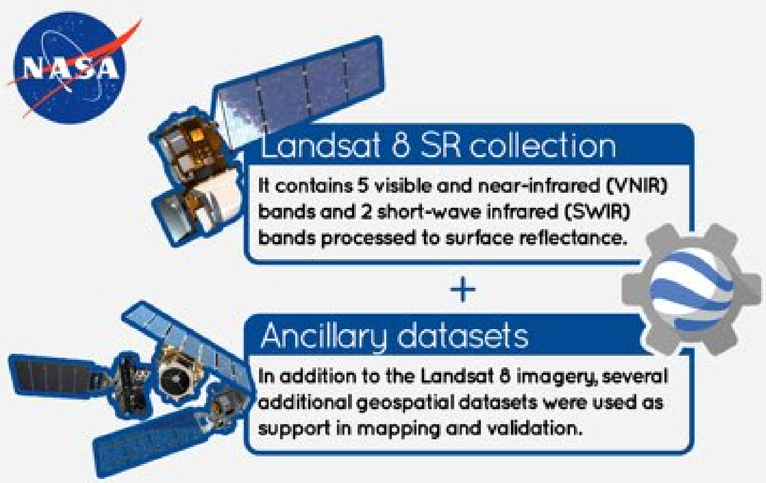


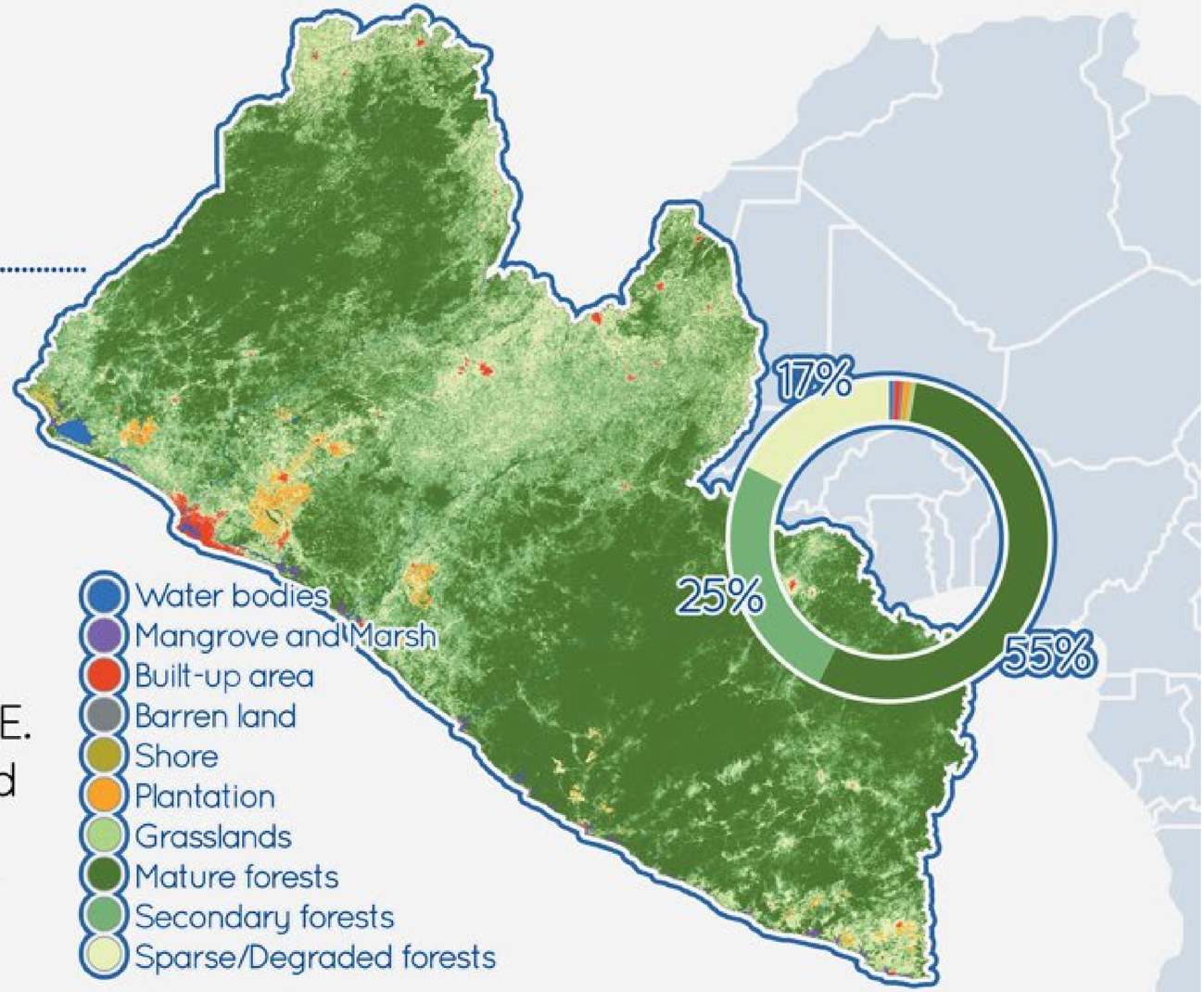


Plant dissimilarity map

Classified map of biotic plant dissimilarity showing regions with broad types of known ecosystems in Liberia.

Resulting Land Cover Map

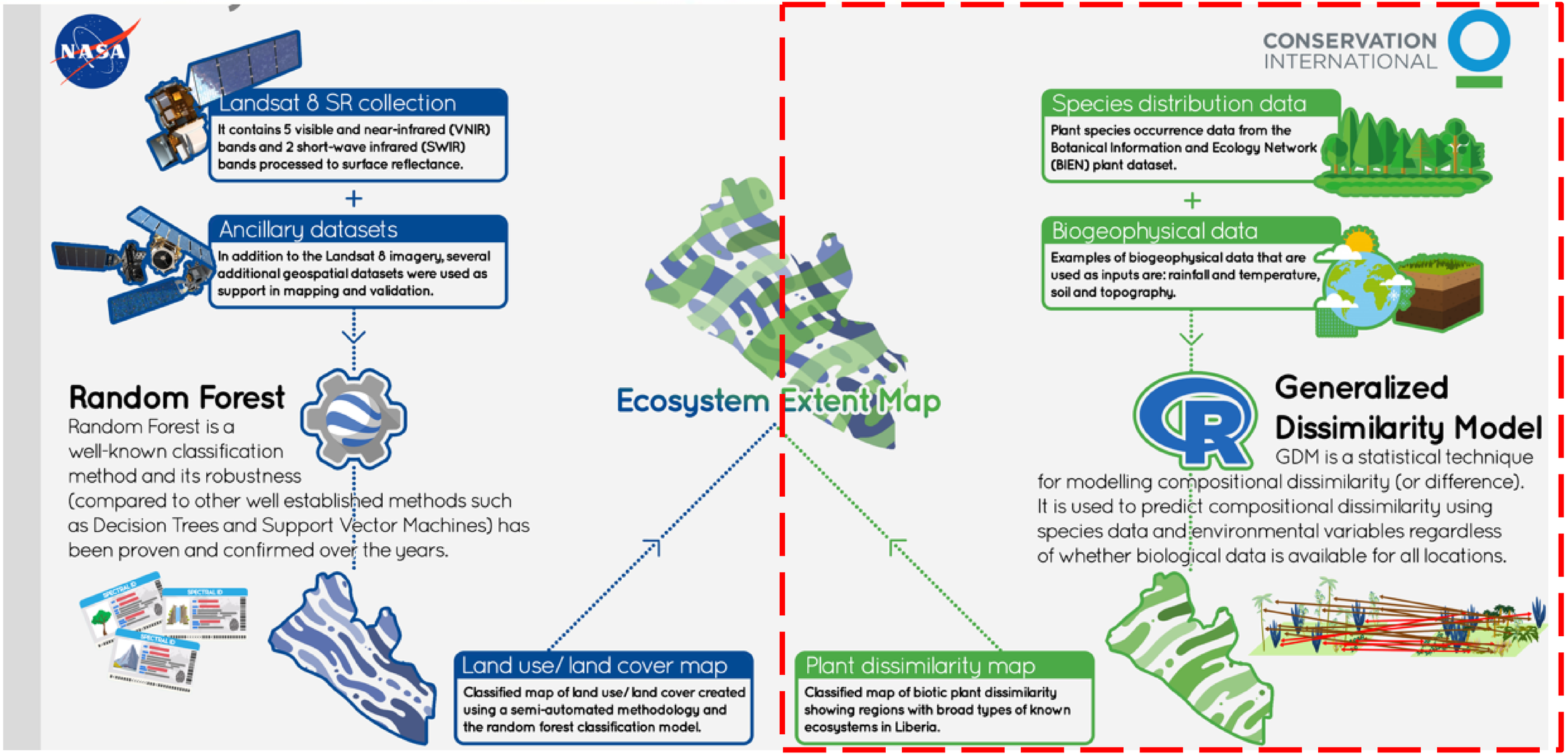




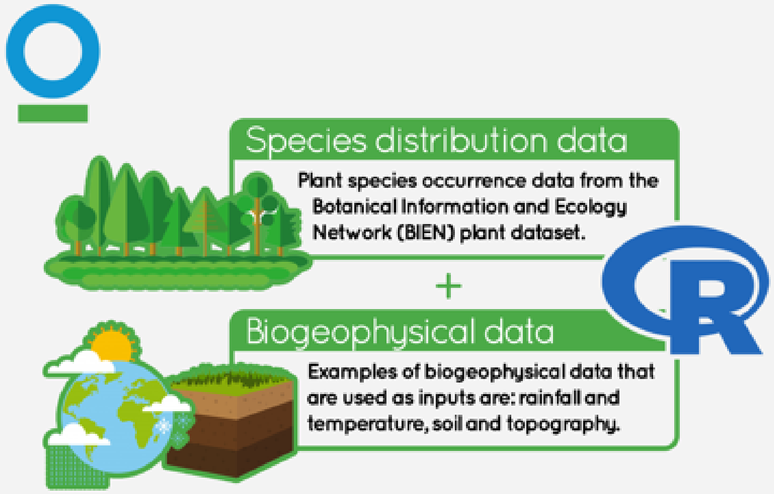
LAND USE/ LAND COVER (LULC) 2015

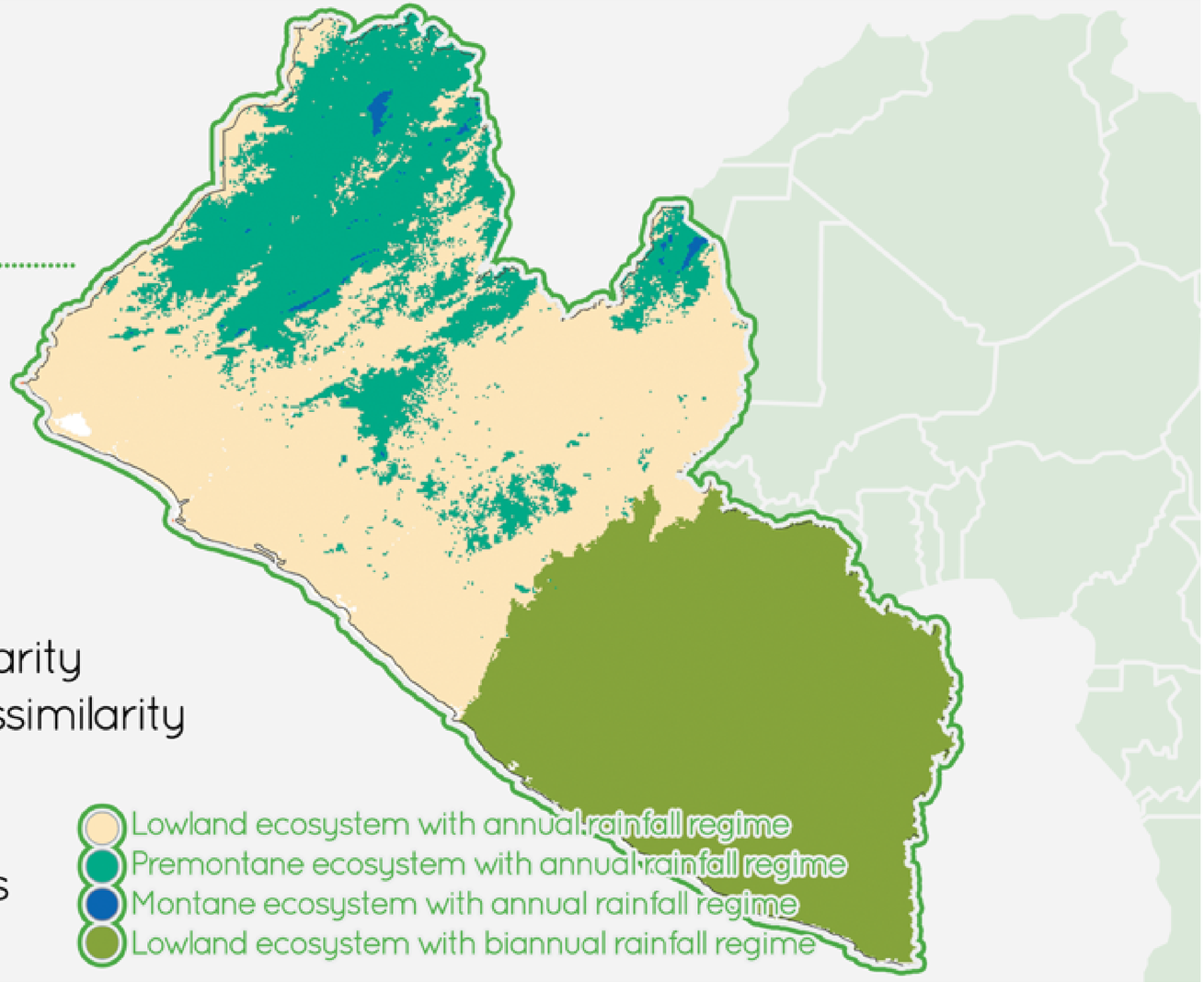
The 30-m resolution LULC map for the 2015 epoch for Liberia produced with GEE. Our approach, while relatively simple and highly replicable, was able to produce a high quality land-use land-cover product with an overall accuracy of 83%.

The CI-NASA Partnership Approach (cont.)



Resulting Map of Biomes

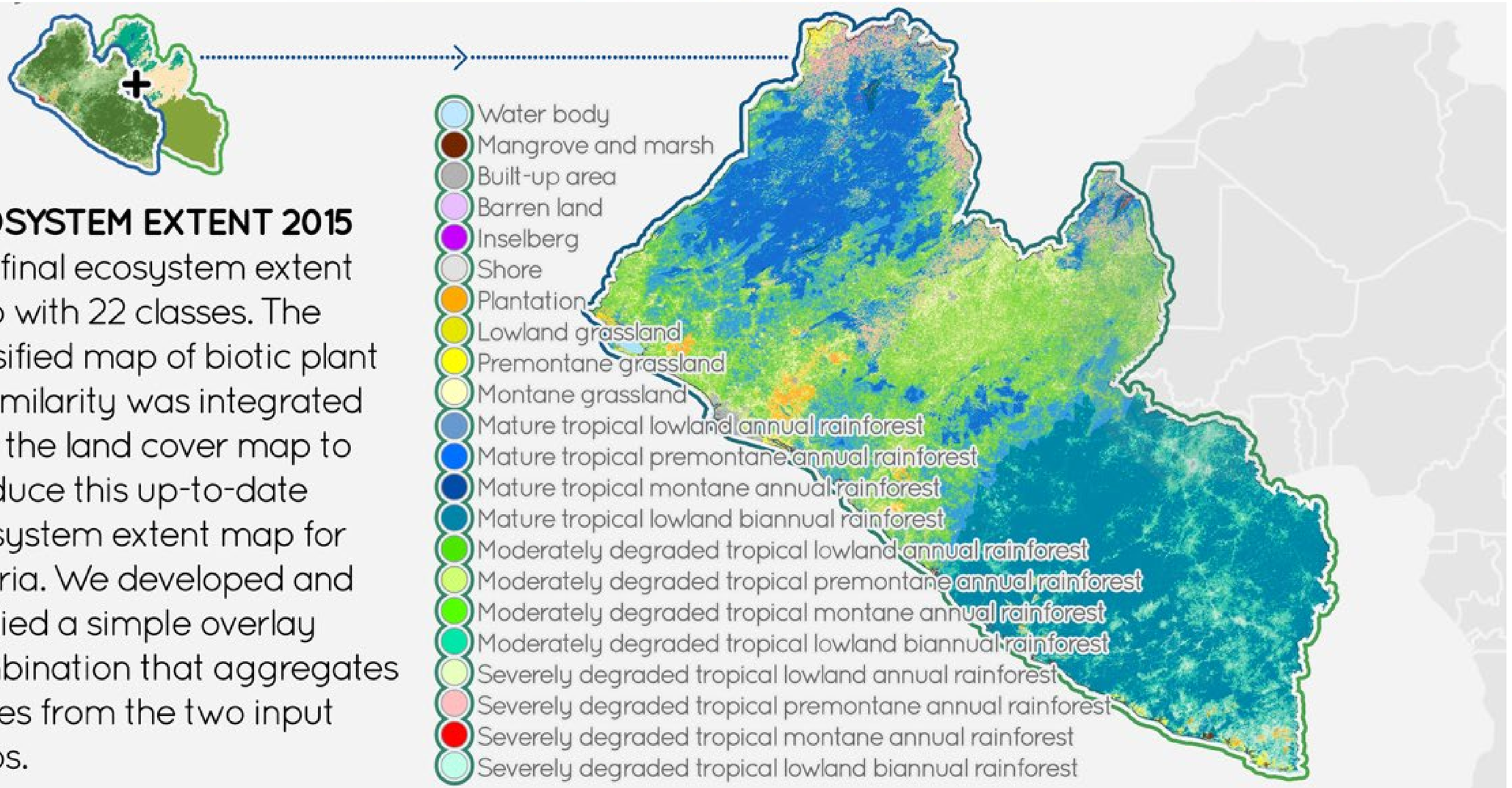




ECOSYSTEM MODELING

The classified map of biotic plant dissimilarity for Liberia derived from a generalized dissimilarity modeling (GDM) approach showing discrete boundaries of the potential spatial distribution of specific ecosystems in Liberia.

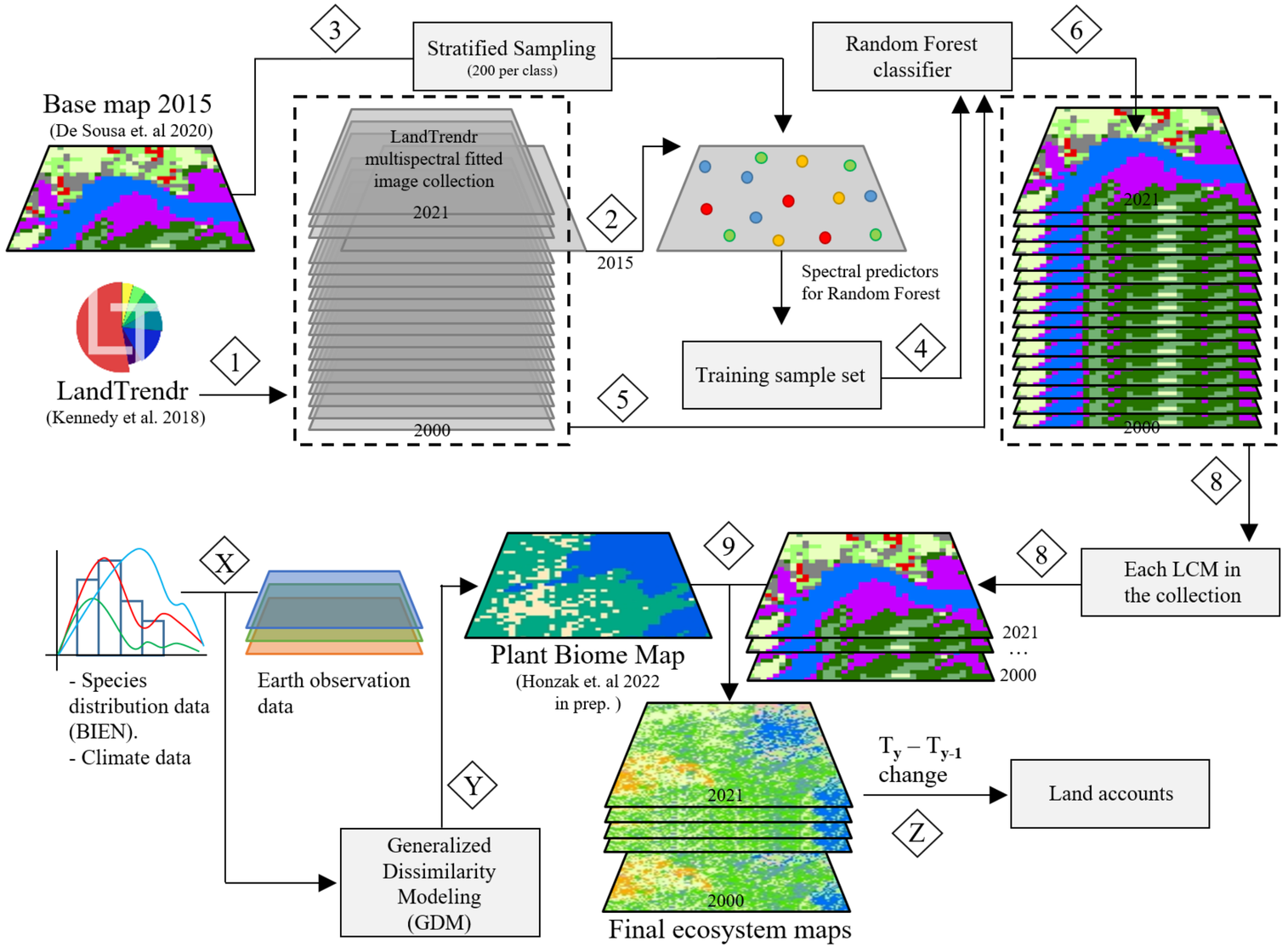
Resulting Ecosystem Extent Map



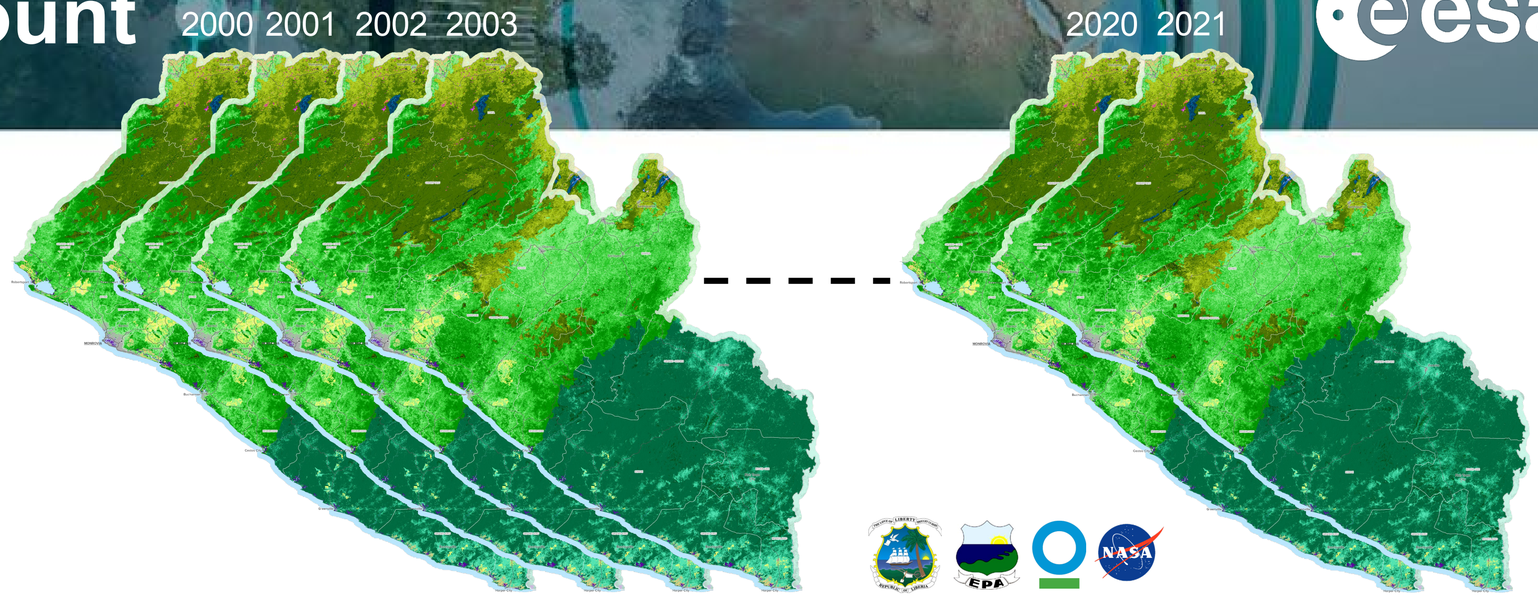
ECOSYSTEM EXTENT 2015

The final ecosystem extent map with 22 classes. The classified map of biotic plant dissimilarity was integrated with the land cover map to produce this up-to-date ecosystem extent map for Liberia. We developed and applied a simple overlay combination that aggregates values from the two input maps.

Annual Time Series of Ecosystem Maps



Ecosystem Extent Account



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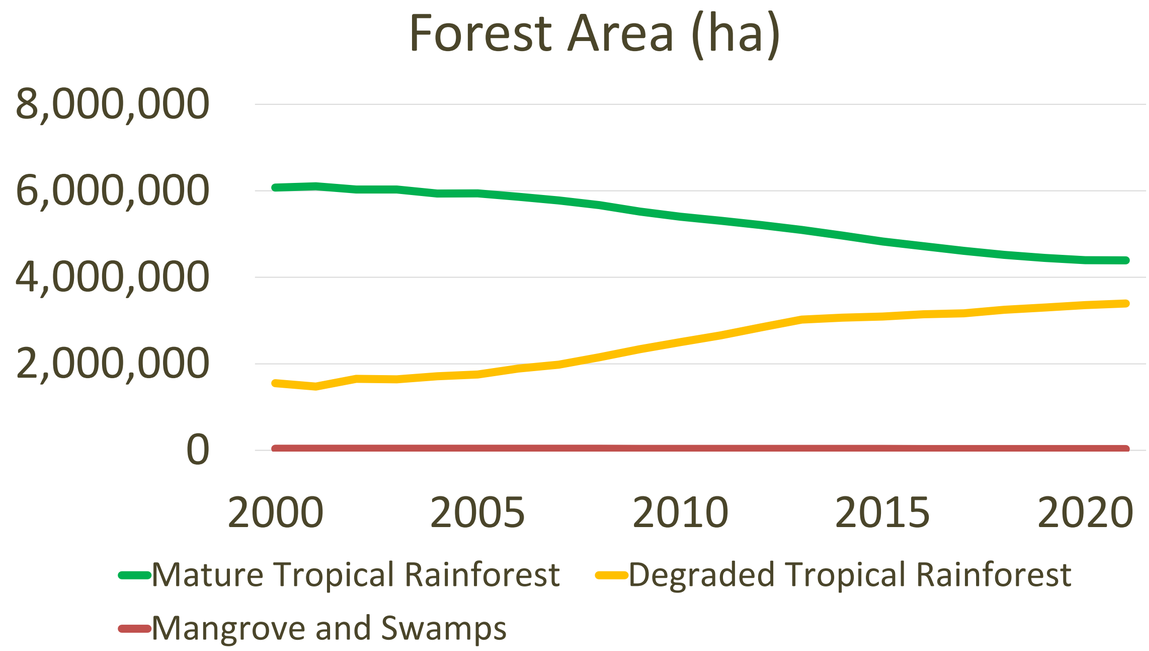
MILLION
hectares of **mature tropical rainforest** in Liberia in 2021



28

PERCENT
of mature tropical rainforest **degraded and converted** between 2000-2021

Advantages and Challenges

Google Earth Engine

GEE's computing infrastructure revolutionizes time-consuming remote sensing processes, facilitates access to a large catalogue of Earth observation data, and paves a new way forward for rapid land cover classification.

R Statistical Package

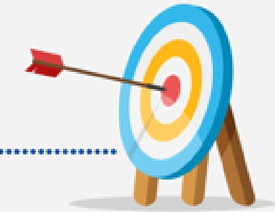
R is by far one of the most comprehensive statistical analysis software available. It is free, open-source and it has over 10,000 packages in the CRAN repository which are constantly growing.

Low cost

GEE and R are 100% free!
No need for expensive software, computers and servers.

Replicability

A more streamlined methodology which facilitates its replication and transfer.



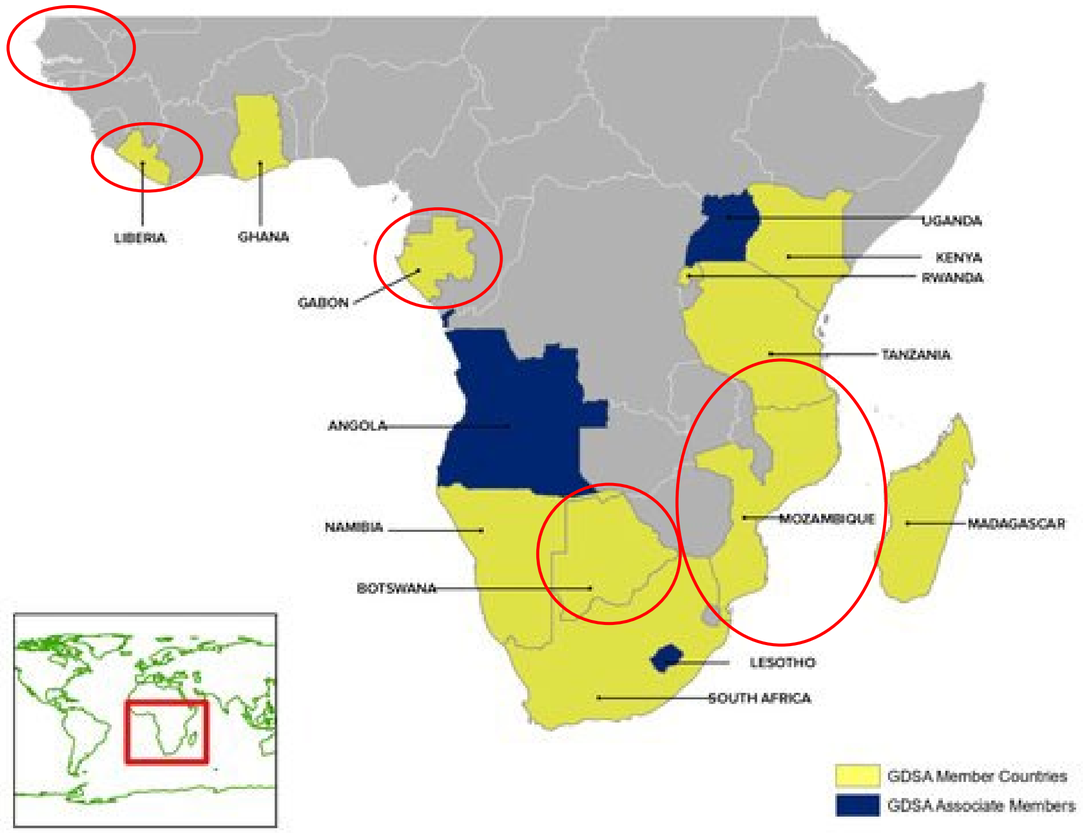
Accuracy

State of the art algorithms and classifiers ensure acurate and high quality maps.

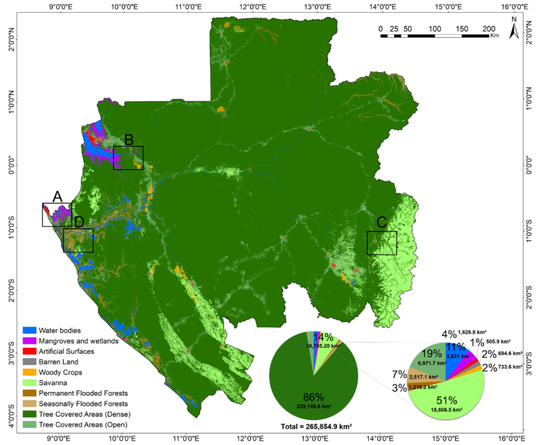
Opportunities and Recommendations

GDSA Countries

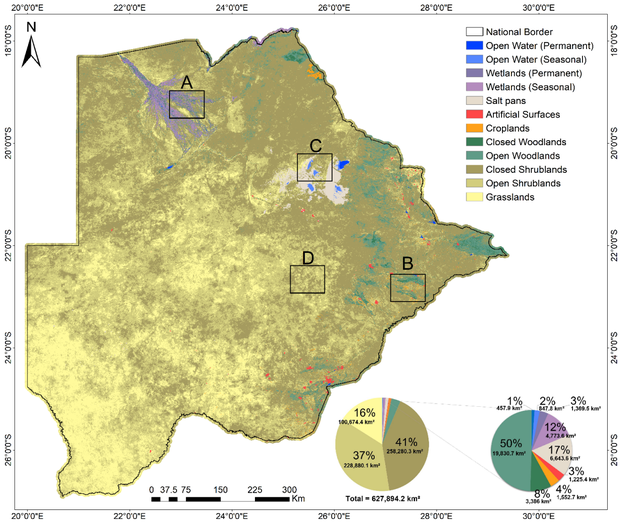
Senegal



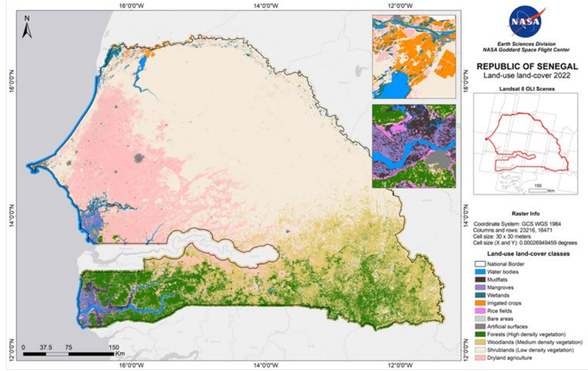
Gabon



Botswana



Senegal



Acknowledgements

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The information shared here is the result of the implementation of the System of Environmental-Economic Accounting Ecosystem Accounting in Liberia. Conservation International and its partners have made every effort to ensure the accuracy and reliability of the information provided in this presentation. Please note that these findings are preliminary results intended purely for discussion. Results may contain inconsistencies due to the input data that were sources from different sources. Do not cite or circulate the contents of this document without obtaining a permission from Conservation International.

The following people directly or indirectly contributed to the development of the presented products: Miroslav Honzák (CI), Celio de Sousa (NASA), Trond H. Larsen (CI), Timothy Wright (CI), Christopher Neigh (NASA), Temilola Fatoyinbo (NASA), Patrick Roehrdanz (CI), Rosimeiry Portela (CI), Daniel Juhn (CI), Zargou E. Whapoe (EPA of Liberia), Keith Gaddis (NASA), Woody Turner (NASA), Roger Sayre (USGS), Andrew Skowno (SANBI), Andrew Hoskins (CSRIO), Simon Ferrier (CSRIO).

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Thank You!

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