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# Remote Sensing Based Monitoring of Land Surface Dynamics in West Africa

**WARN Workshop, March 24-25<sup>th</sup> 2021**

## 1. Background and Rationale

Land is the principal basis for the livelihood and well-being of majority of West Africans, providing food, freshwater, supporting biodiversity and other critical ecosystem services. However, increasing population growth, unsustainable management practices, and climatic change are reducing the productivity of land and its capacity to support livelihoods. For example, the need to increase agricultural production to ensure food security for a burgeoning population has resulted in significant deforestation, forest degradation, and biodiversity loss as cropland expansion into forest areas is the principal means smallholders use to increase production. Low nutrient input, soil and wind erosion, and the prevalence of unsustainable agronomic practices have also led to widespread land degradation and desertification. Further, high rural-urban migration and resultant rapid urbanization are drivers of land use/land cover change in and around cities. To improve land management and enhance its productivity for livelihood support, it is essential to improve the monitoring of land surface dynamics for decision making and policy formulation. Accurate and up-to-date monitoring of forest cover, biomass, fires, vegetation dynamics and carbon stocks, biodiversity, soil characteristics/properties, land use/land cover changes and conversions, etc., are critical for the design and implementation of targeted land productivity interventions. In addition, assessing potential changes in the future based on factors such as climate change is important to develop appropriate strategies to remediate impacts on the environment and livelihoods.

Remote Sensing (RS) data are suited for assessing and monitoring land surface dynamics due to repeatability of acquisitions and large area coverage. Availability of multiple spatial, spectral, and temporal resolution RS data increases its suitability to monitor a wide range of land surface characteristics. Also, increasing availability of multi-sensor open access RS data, especially in data poor regions such as West Africa, provides an opportunity to improve monitoring of land surface dynamics from local to regional scales. In particular, the combination of high temporal but low spatial resolution and high spatial but low temporal resolution data enables assessment of local as well as regional scale dynamics. In addition to increased access to data, processing applications (software) and algorithms (e.g. SNAP, QGIS, R, etc.) are increasingly becoming available at no cost. Moreover, in recent years, the development of processing routines on cloud computing platforms (e.g. Google Earth Engine) is set to eliminate challenges with inadequate data processing power, especially for large scale analysis and monitoring of land surface dynamics.

These enabling conditions call for increased use of RS data in monitoring changes in land surface characteristics to support the management of land resources. This is critical for regions identified as climate change hotspots such as West Africa. Accurate information on land surface dynamics such as land use/land cover changes are needed to project future climate change as well as develop appropriate strategies to adapt and mitigate the impact of future climatic changes. This calls for a concerted effort to build synergies and improve capacities in the use of RS data in West Africa through existing regional networks and collaborative initiatives.



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This workshop is part of a series of regional workshops planned within the framework of GOFC-GOLD's twelve regional networks. The workshop coordination is led by three regional institutions namely the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL), the United Nations University Institute for Natural Resources in Africa (UNU-INRA) and African Global Impact Raiser (AGIR). WARN is a network of West Africa nationals who are experienced in the use of earth observation data and analysis to support evidence-based decision making and policy formulation. It further aims at enhancing the capacities of young Africans in accessing and analyzing new data and methods in managing land resources.

## 2. Aim and objectives.

The overall aim of the workshop is to showcase recent research that focused on the use of open access RS data to assess or monitor land surface characteristics in West Africa. It also aims at improving knowledge of ongoing RS-based research/initiatives in the region and fostering closer collaboration between scientists and institutions working on similar topics to provide opportunities for increased synergy. Specific objectives are:

- i. Demonstrate state-of-the-art utility of RS data and analysis to monitor changes in land surface characteristics and to support decision making in West Africa.
- ii. Identify research gaps in the application of RS data for monitoring and managing land resources in West Africa.
- iii. Increase capacity of young researchers in the application of RS data in land resource management.
- iv. Strengthen collaboration between members of WARN.

## 3. Structure of Event and Themes

The workshop will be held virtually on Zoom for two half days from 9.30 am to 1.30 pm. Presentations from WARN network members on four themes will be made during the workshop. The first day will host the first two themes while the second will host the other two. The workshop will also provide opportunity for presentations on recently launched RS-based projects or initiatives that have substantial RS components. Capacity enhancement opportunities will also be highlighted.

Workshop themes:

- i. **Land use/land cover (LULC) dynamics:** assessment of past, present or future LULC changes; derivation/modelling of land surface biophysical variables.
- ii. **Deforestation, forest degradation and biomass:** forest cover monitoring; biodiversity modelling, above-ground biomass modelling.
- iii. **Land degradation:** digital soil mapping; vegetation monitoring; soil erosion modelling.
- iv. **Fire mapping:** forest and bush fires monitoring and modelling; fire risk management; climate and environmental drivers of wildfires.



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#### 4. Expected Outputs

- Workshop report
- Conference proceedings
- Overview of ongoing or soon-to-commence RS-based projects and clearly identified synergies.
- Updated WARN membership list.

#### 5. Profile of participants

Participants should ideally have knowledge in the application of RS data in assessing and monitoring changes in land surface characteristics. Participants could emanate from one or more of the below institutions, sectors, or groups.

- Existing WARN members
- National Mapping Agencies
- Undergraduate or postgraduate students
- University lecturers
- Private GIS/RS companies
- Regional Institutions
- Researchers from the Global North conducting research in West Africa.