

# Supporting Forest Management Using Earth Observation Information in Bhutan

ICIMOD

FOR MOUNTAINS AND PEOPLE

Bhutan, one of eight regional member countries of the International Centre for Integrated Mountain Development (ICIMOD), is experiencing urban expansion, increased demand for agricultural land, and other developmental pressures. To address these issues, ICIMOD and its partners are developing a harmonized land cover monitoring system to assess changes in land cover and use to help conserve biodiversity, to manage natural resources, and to protect the environment. This is also important for developing sustainable livelihoods, particularly for rural communities.

Forest fires, both human-induced and natural, and a number of other factors contribute to deforestation and forest degradation. Earth observation and geospatial technology provide reliable, timely, and cost-effective methods and tools for monitoring forests and understanding change.

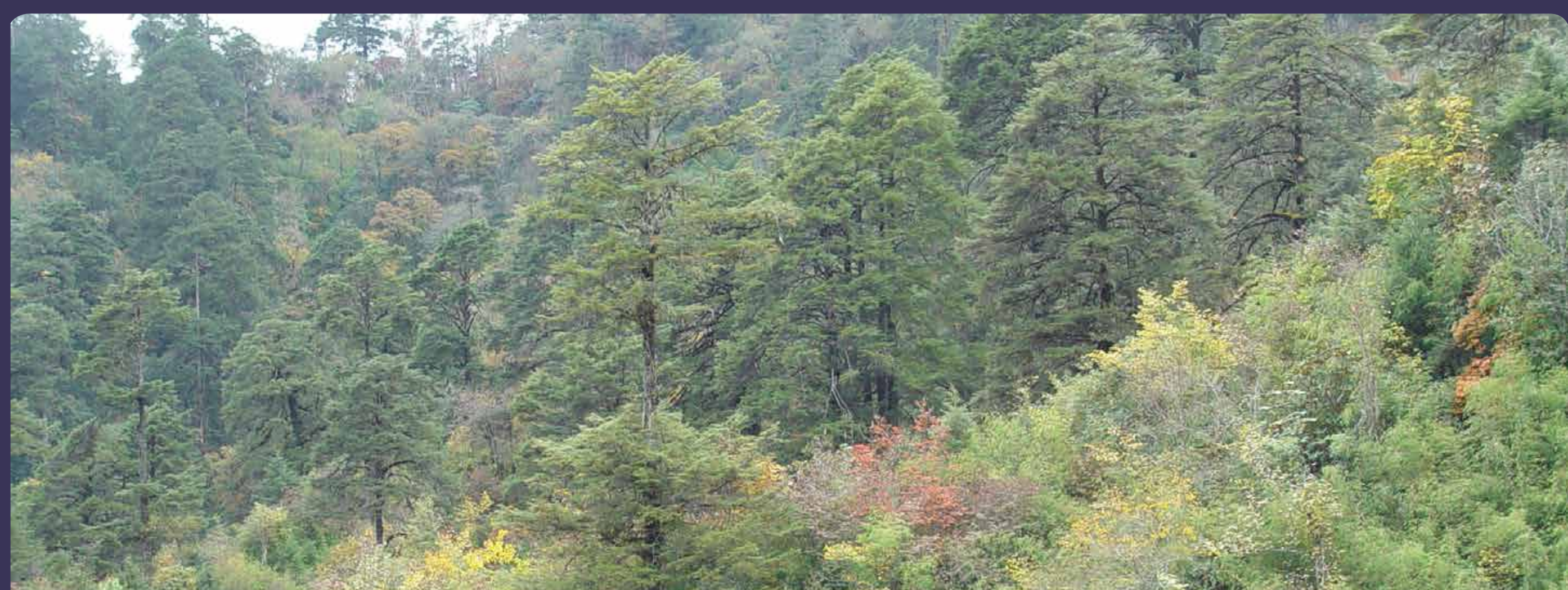
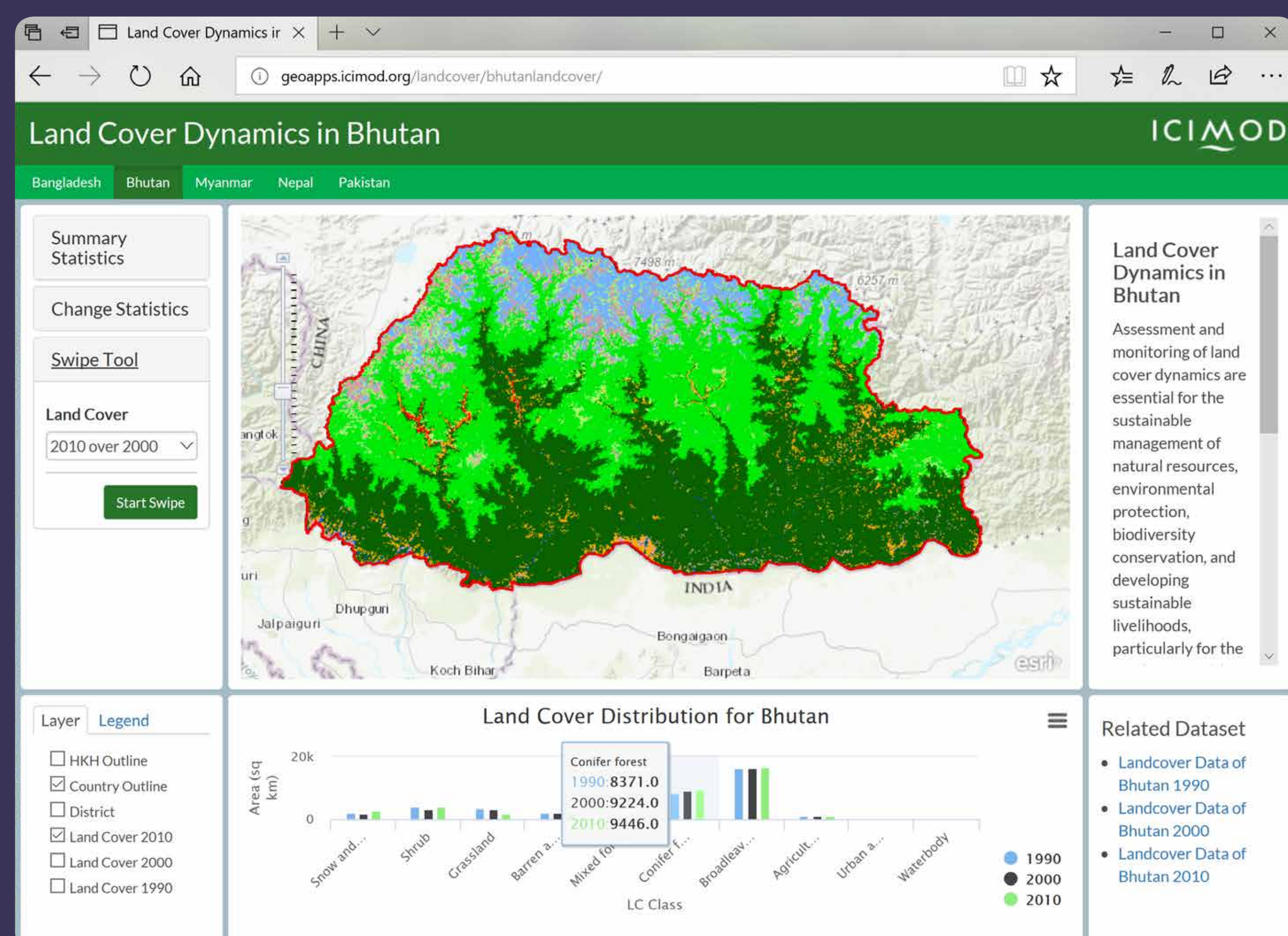
## Land Cover Dynamics in Bhutan

Assessment and monitoring of land cover dynamics are essential for environmental protection, biodiversity conservation, the sustainable management of natural resources, and the development of sustainable livelihoods – particularly for rural communities in the Hindu Kush Himalaya (HKH) who depend on land and on ecosystems for livelihoods and thus experience increased vulnerability when land cover dynamics change.

The interactive system provides easy access to harmonized land cover data developed for Bhutan over different time periods (1990, 2000, and 2010), and provides user-friendly tools for generating statistics to understand change processes and to support informed decision making. It can provide land cover statistics for the whole country or a selected district.

A swipe tool can be used to explore land cover changes over different years in an interactive manner. The application can be accessed through the following URL:

[geoapps.icimod.org/landcover/bhutanlandcover](http://geoapps.icimod.org/landcover/bhutanlandcover)



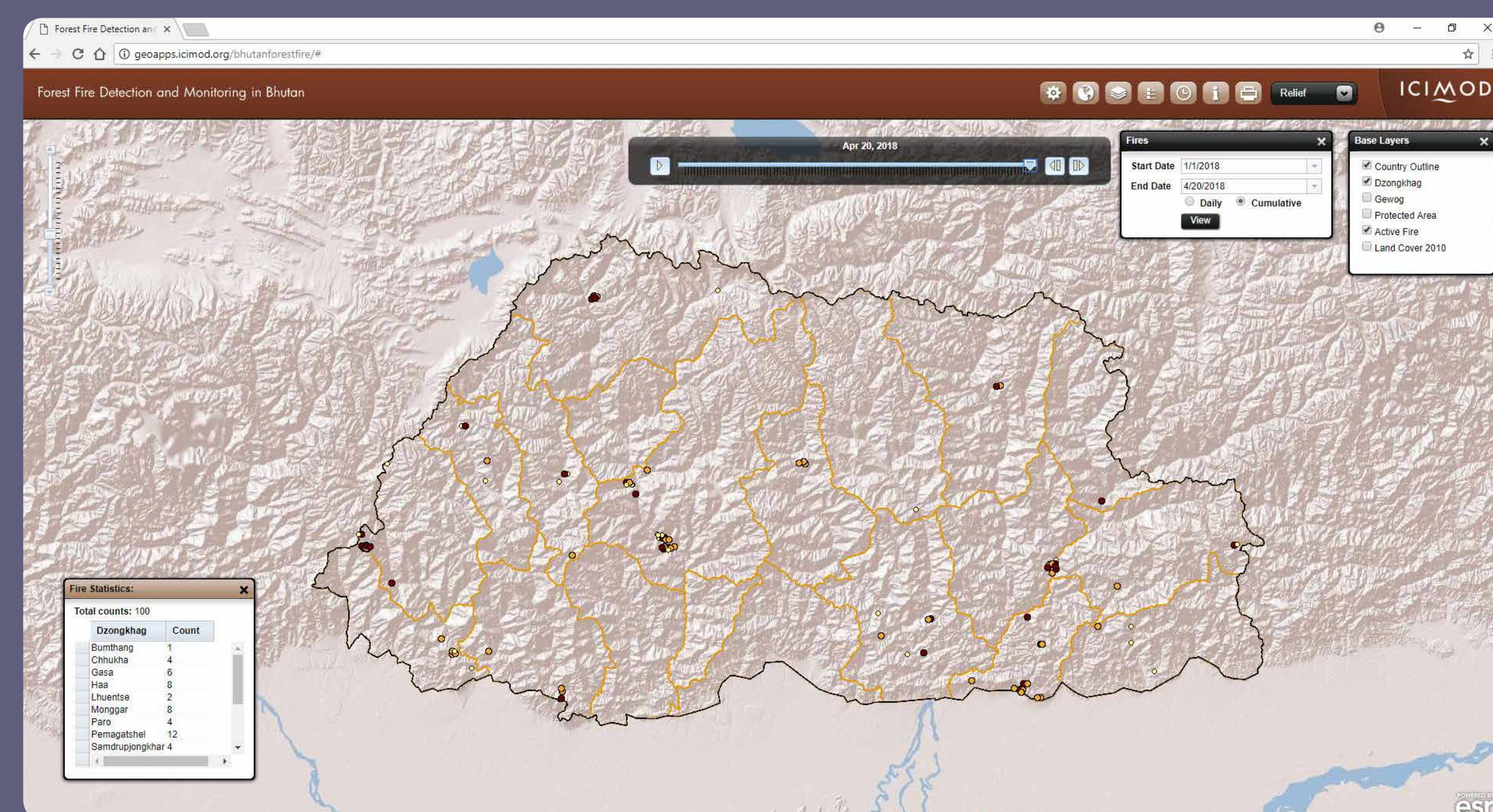
## About SERVIR

ICIMOD serves as the Hindu Kush Himalayan hub of SERVIR – a joint development initiative of the United States Agency for International Development (USAID) and the National Aeronautics and Space Administration (NASA). SERVIR promotes and enables the use of Earth observation (EO) and geospatial technologies for improved environmental and developmental decision making with the following thematic foci: food security and agriculture; water resources and hydro-climatic disasters; land cover, land use change, and ecosystems; and weather and climate services.

## Forest Fire Detection and Monitoring System in Bhutan



In close collaboration with the Department of Forests and Park Services of Bhutan, ICIMOD developed a forest fire detection and monitoring system for Bhutan based on the National Aeronautics and Space Administration (NASA)'s Moderate Resolution Imaging Spectroradiometer (MODIS) data. The system facilitates automated data acquisition, processing, and reporting of fire location information. The MODIS sensor on the Terra and Aqua satellites is used because of its high repetitive synoptic coverage.



The system undertakes a number of geo-processing tasks to attach important information on nearby administrative units, protected areas, and land cover information to active fire data. An email notification containing detailed information on individual fires is sent to concerned users. An interactive mapping application helps visualize active fire locations on any given day and provides statistics on fire incidences per district. Using a time slider, users can view fire incidences over a certain time period.

The system can provide information on fire incidence on a near real-time basis.

The system can be accessed online through the following URL:

[geoapps.icimod.org/Bhutanforestfire](http://geoapps.icimod.org/Bhutanforestfire)

