



Geospatial Information and Earth Observations: Supporting Official Statistics in Monitoring the SDGs



UNSC STATISTICAL-GEOSPATIAL INTEGRATION FORUM
United Nations • 7 March 2016

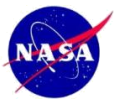


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For Sustainable Development



Session III. Geospatial and Earth Observations Data as Inputs to the Indicators

Lawrence Friedl
USA / NASA



Earth Observations & Geospatial Information



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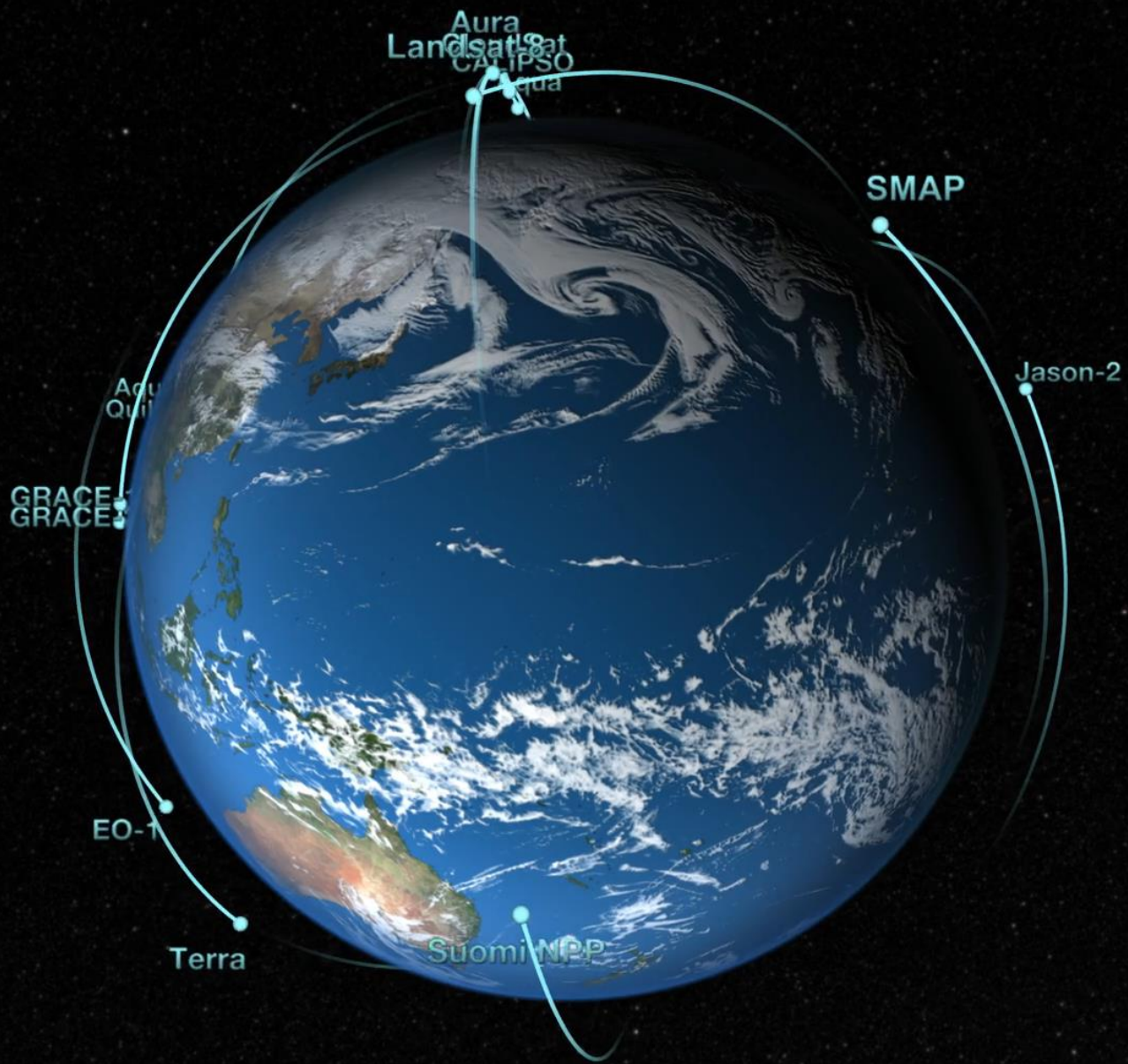


**Space-based
Satellites**

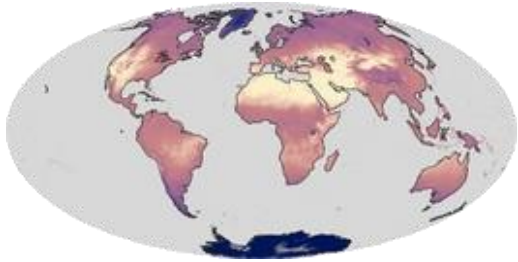
Airborne

Ground-based

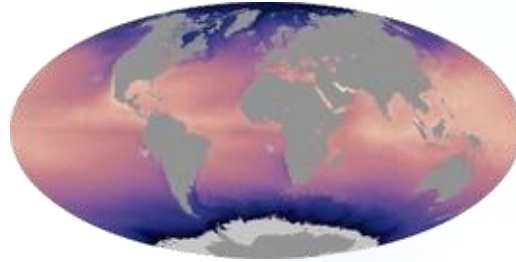
In Situ



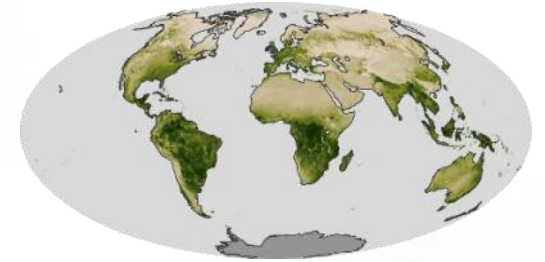
Some Types of Earth Observations . . .



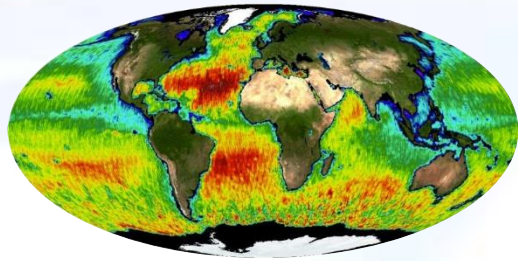
Land Temperature



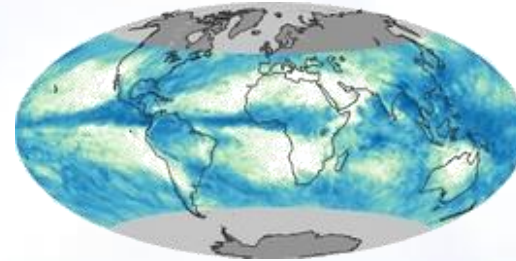
Sea Surface Temperature



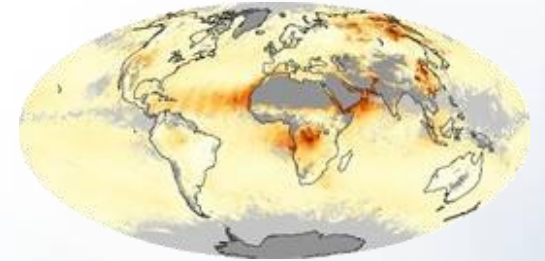
Vegetation



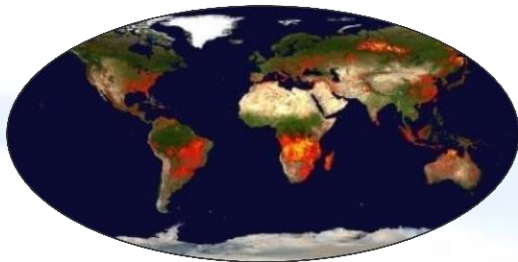
Sea Surface Salinity



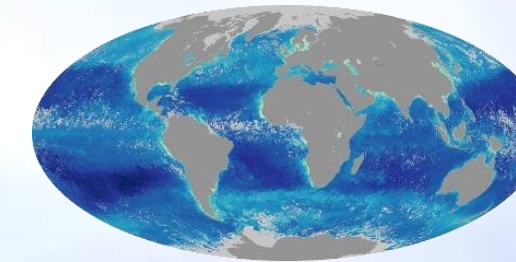
Total Rainfall



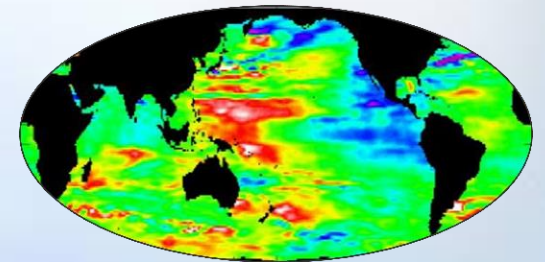
Aerosols



Fires & Thermal Anomalies

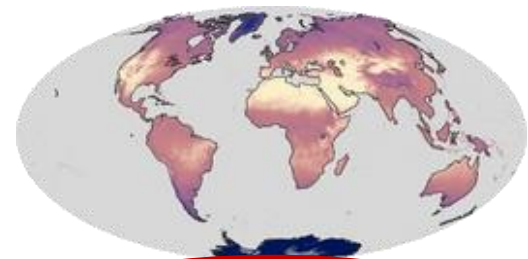


Chlorophyll



Sea Surface Height

Some Types of Earth Observations . . .

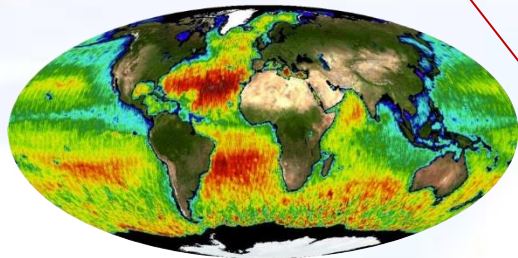


Land Temperature

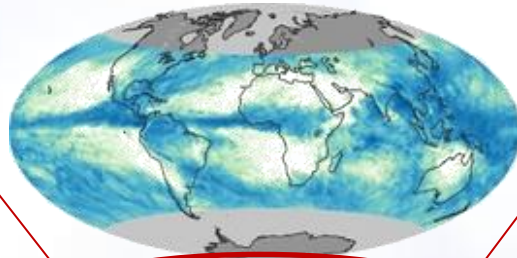
**Environmental factors
for malaria
transmission**



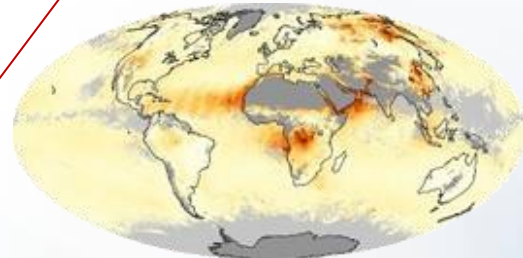
Vegetation



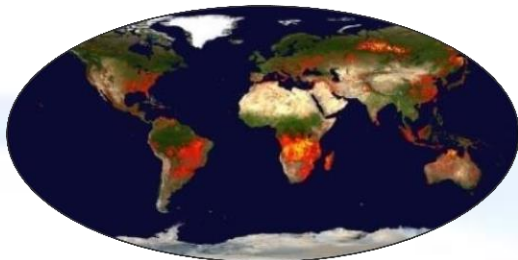
Sea Surface Salinity



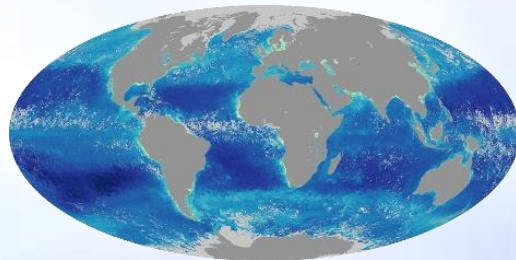
Total Rainfall



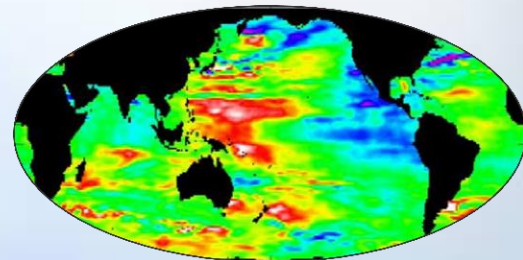
Aerosols



Fires & Thermal Anomalies

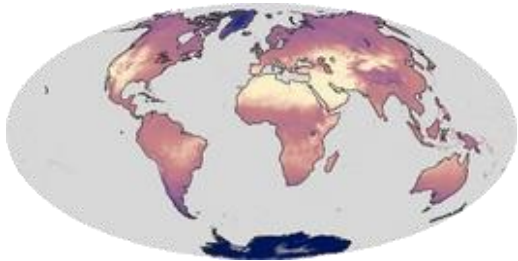


Chlorophyll

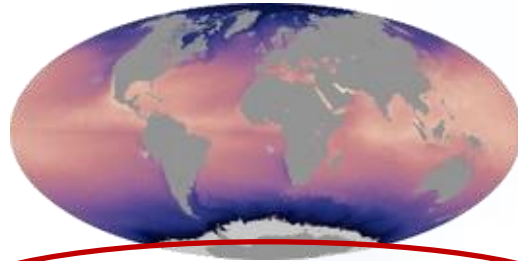


Sea Surface Height

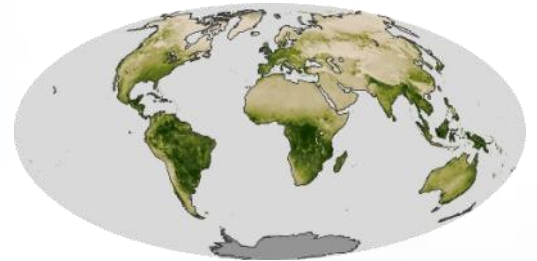
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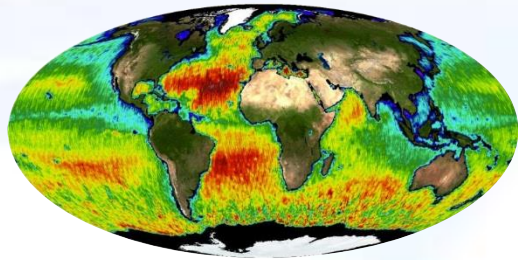
Land Temperature



Sea Surface Temperature



Vegetation



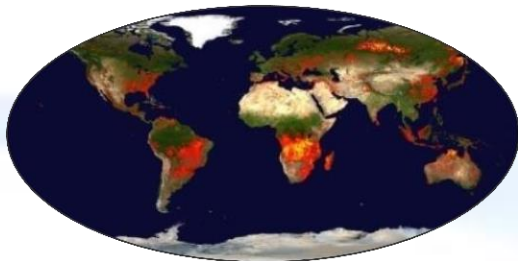
Sea Surface Salinity



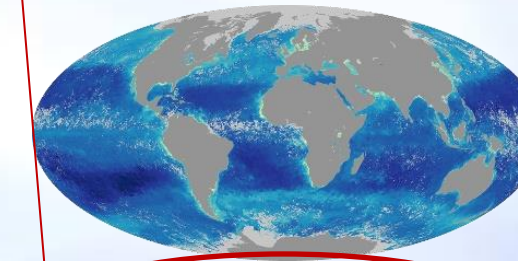
Total Rainfall

Soils

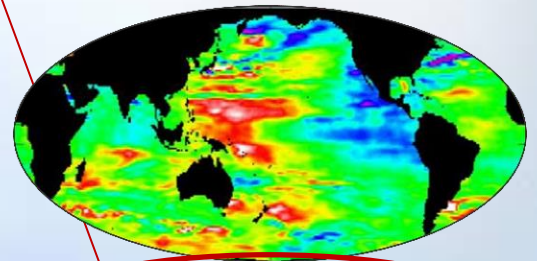
**Environmental factors
for fisheries
management**



Fires & Thermal Anomalies



Chlorophyll



Sea Surface Height



Indicator 15.1.1

Forest area as a percentage of total land area

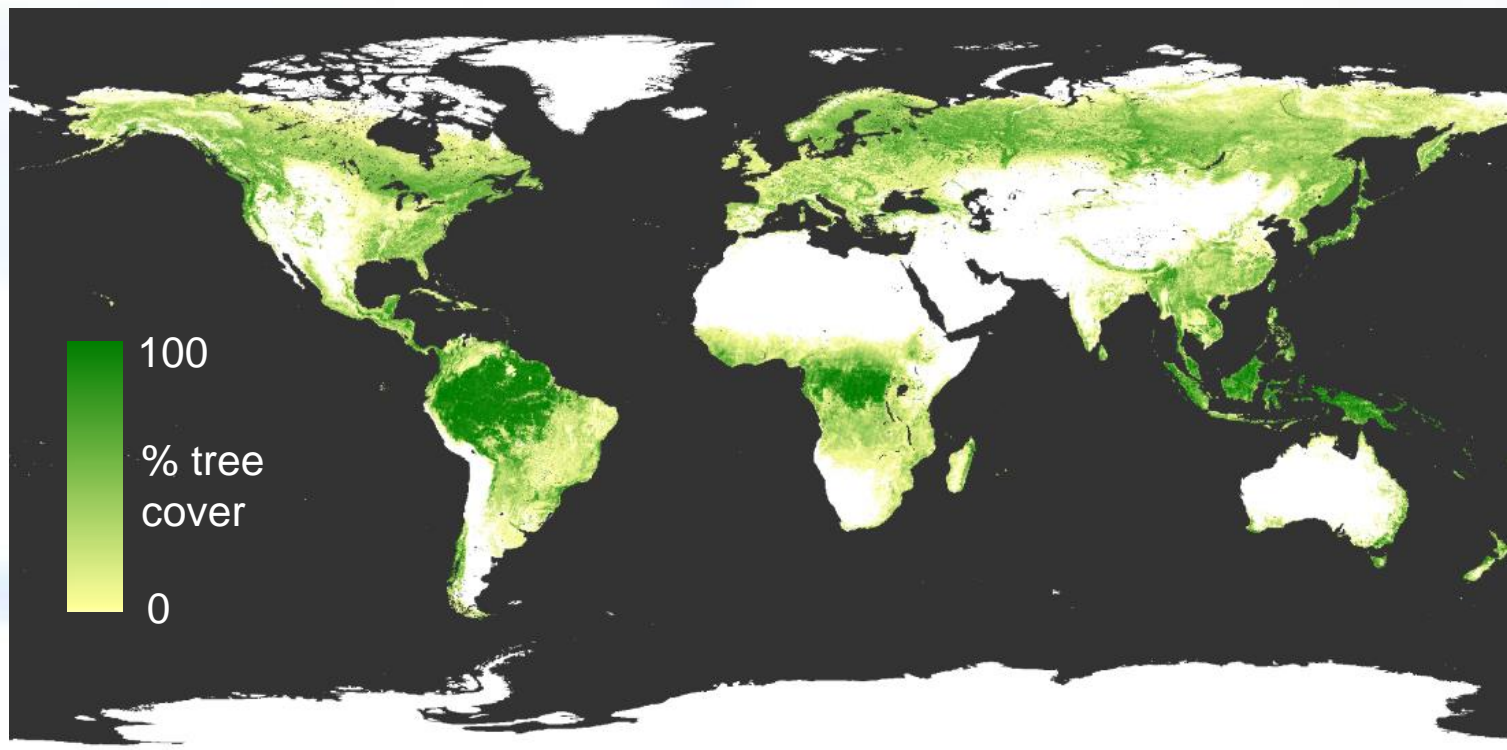


Target 15.1

By 2020 ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands...

Forest Area from Earth-observing Environmental Satellites

2013 Tree Cover





Indicator 15.1.1

Forest area as a percentage of total land area



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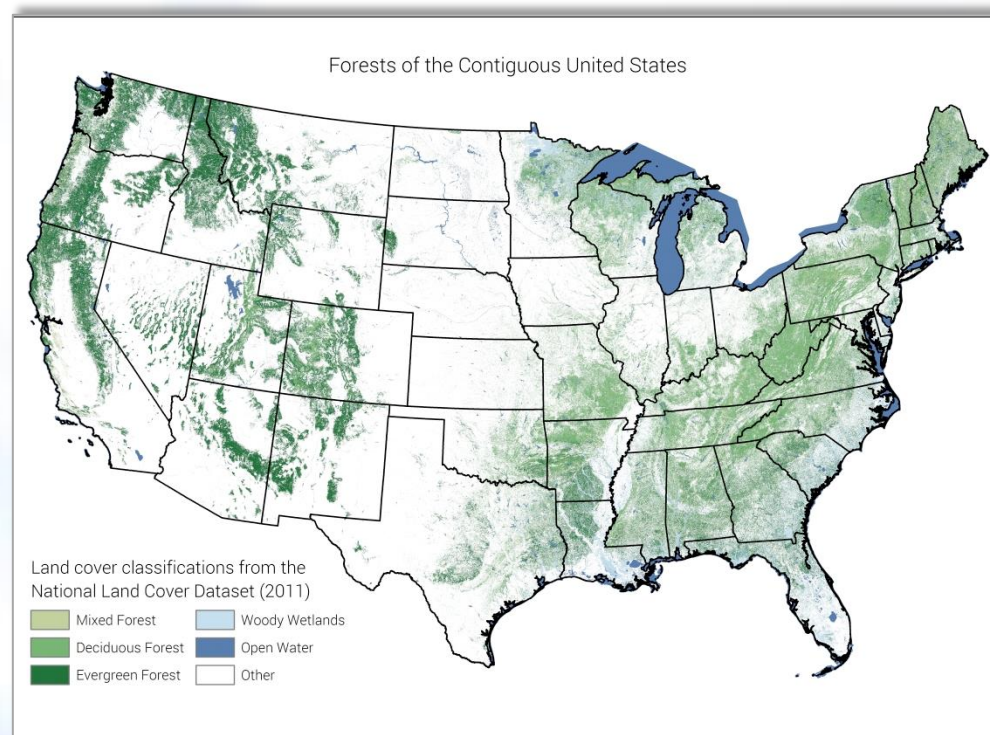
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Forests in Contiguous USA: 29% of land area (2011)

Forest Cover \equiv
Trees greater than
16 feet tall and make
up greater than 20
percent of the total
vegetation cover.

Data Source:
U.S. National Land
Cover Dataset
based on Landsat
satellites.



US: <http://www.globalchange.gov/browse/indicators/indicator-forest-cover>

Credit: NLCD



Indicator 15.1.1

Forest area as a percentage of total land area



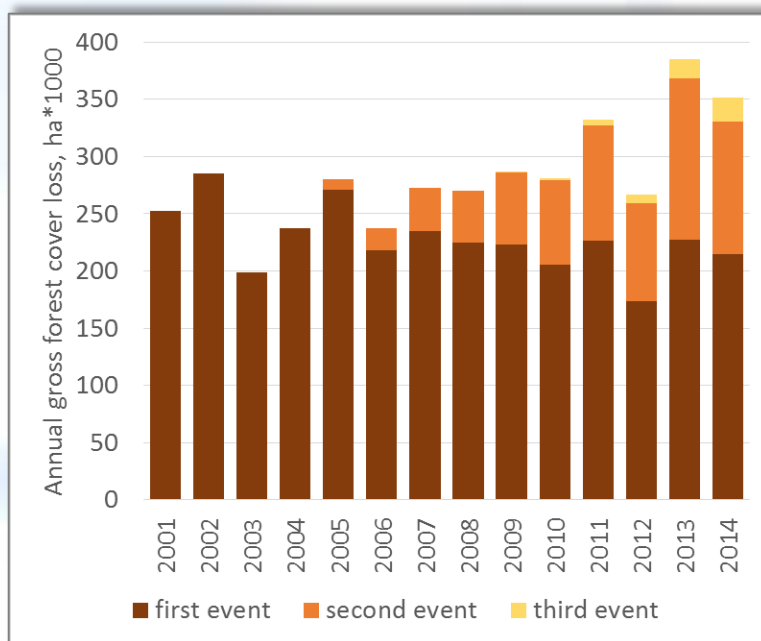
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Target 15.1

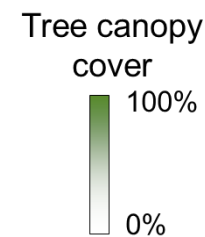
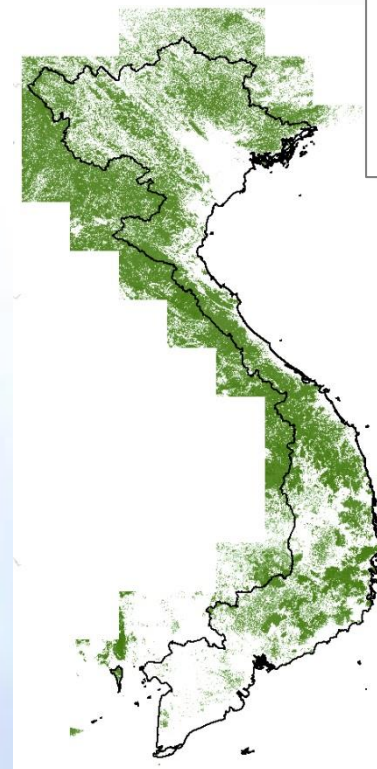
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Vietnam: Forest Cover Mapping

**Total annual gross forest cover loss 2001-2014:
3.2 million ha.**



2014





Indicator 15.1.1

Forest area as a percentage of total land area

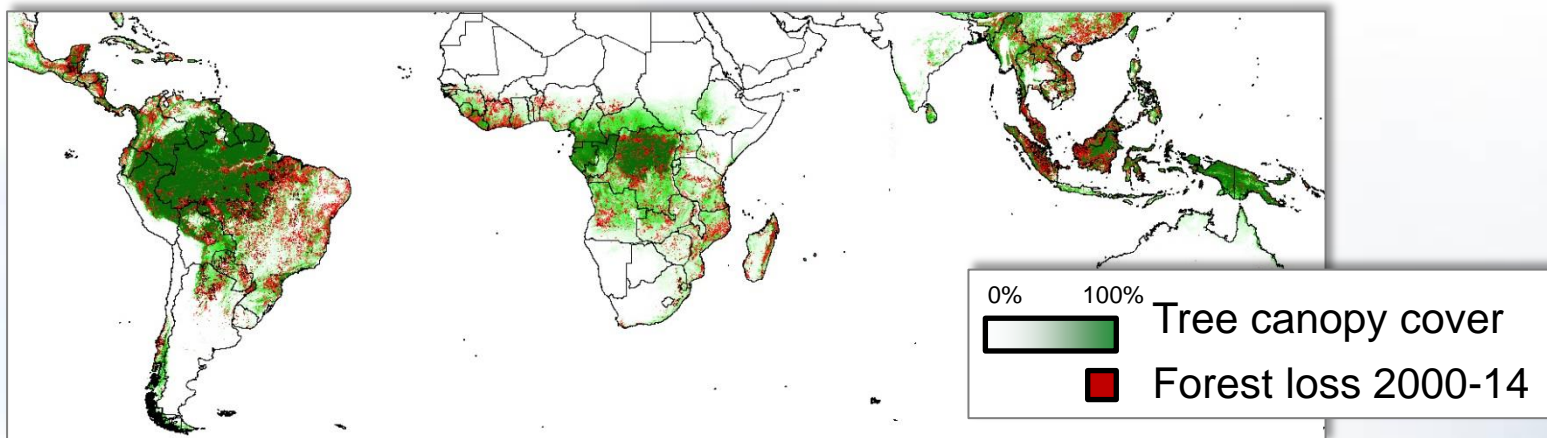


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Gross Forest Cover Change: 2000-2014



<< Annual loss shown using 3-year mean filter



Indicator 11.6.2

Annual mean levels of fine particulate matter (i.e. PM_{2.5} and PM₁₀) in cities (population weighted)



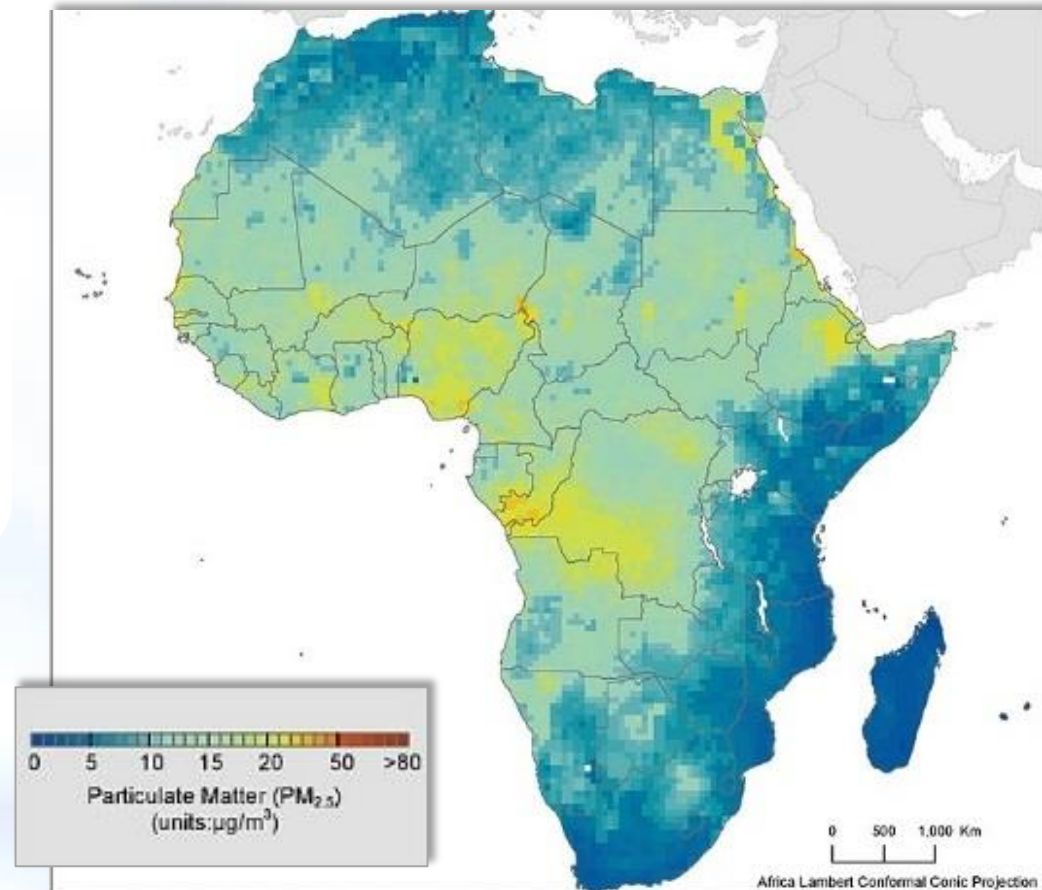
Target 11.6

By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management

Air Quality: Annual Average PM_{2.5} Grids

Background image:
Data from 2010.

Data Source:
Aerosol Optical Depth
from MISR and
MODIS sensors on
Terra & Aqua satellites.





Indicator 11.6.2

Annual mean levels of fine particulate matter (i.e. PM_{2.5} and PM₁₀) in cities (population weighted)



Target 11.6

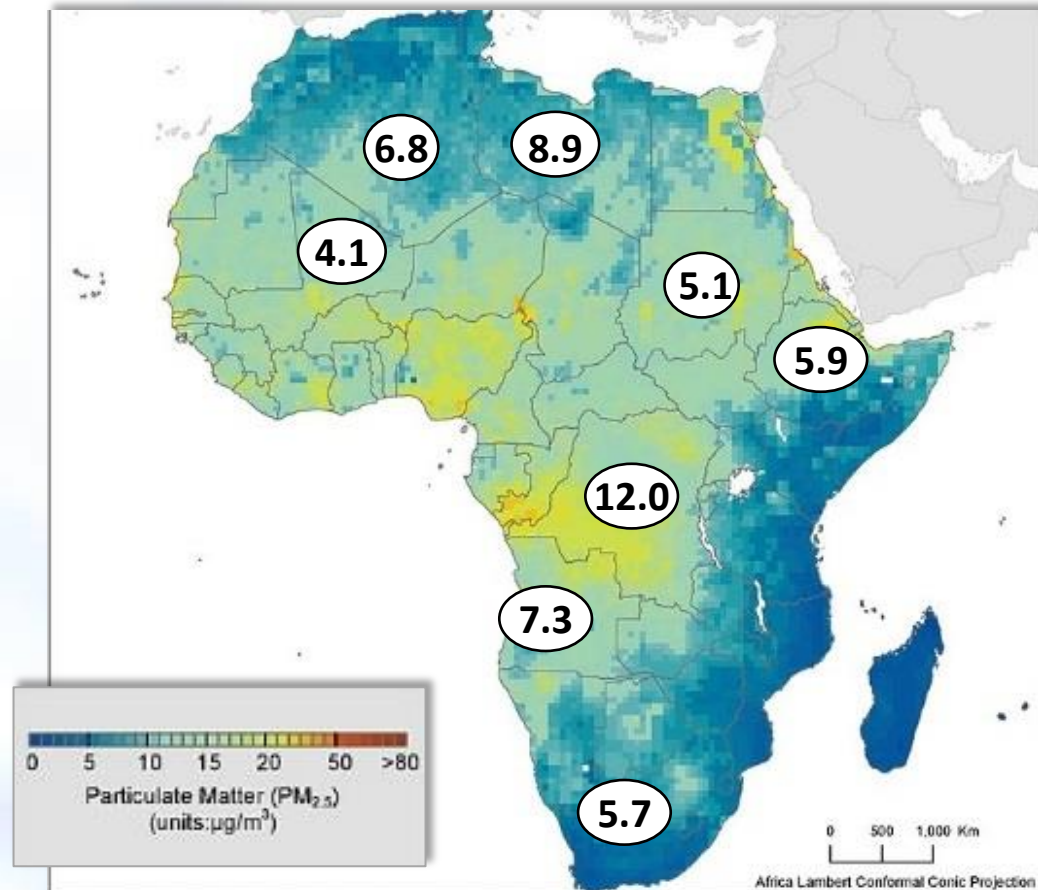
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Air Quality: Annual Average PM_{2.5} Grids

Background image:
Data from 2010.

Circled values:
Two-year (2012-2014)
country-specific values
based on average
population-weighted
exposure.

Data Source:
Aerosol Optical Depth
from MISR and
MODIS sensors on
Terra & Aqua satellites.



Other Examples & Pilots in Development ...



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Indicator 3.9.1:

Population in urban areas exposed to outdoor air pollution levels above WHO guideline values

Approach/Data Sources:

US Census: Urban Areas in US (1:2000); Global gridded population dataset; Global population distribution at subnational level.

NASA: EPA AIRNow point-based air quality network; MERRA aerosol reanalysis.



Indicator 11.7.1:

Average share of the built-up area of cities that is open space in public use for all

Approach/Data Sources:

US Census: Vector data for infrastructure and public land ownership (1:2000); parcel data and municipal sources for open space definitions.

NASA: Landsat-based mapping of land cover for urban areas and open space.



Indicator 15.3.1:

Percentage of land that is degraded over total land area.

Approach/Data Sources:

US Census: Gridded population distribution (100m grid) Demobase for Sub-Saharan Africa, others.

NASA: Vegetation rigor from satellites (1981-present); 50cm satellite imagery; NASA GMAO reanalysis precipitation.

Other Examples & Pilots in Development ...



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3 GOOD HEALTH
AND WELL-BEING



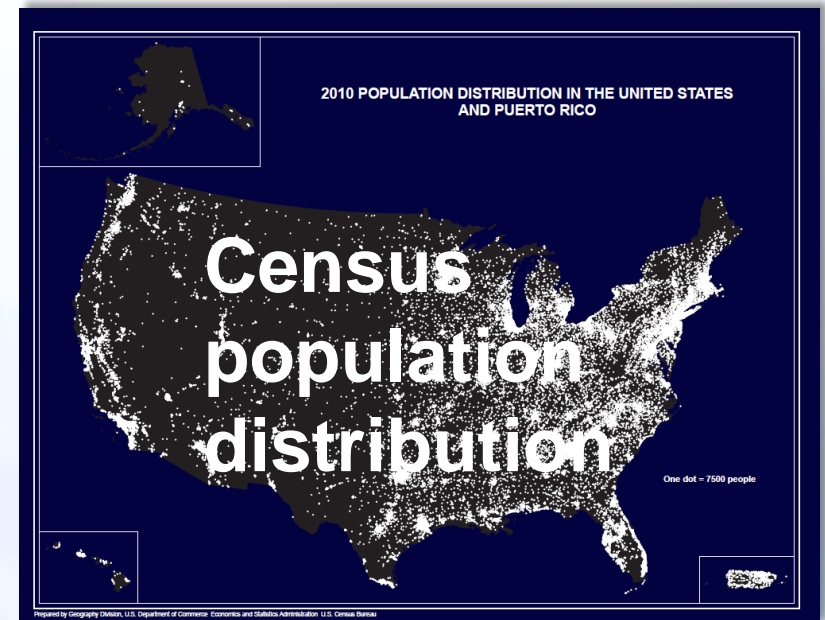
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Taking it to scale . . .



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Next Steps

Work with statistical agencies to ensure the methods are sound for use with Indicators and Targets

Ensure the methods and solutions are available for all to use

Support countries and stakeholders to use the methods and build capacity

Taking it to scale . . .



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UNStats



others

Training: Earth Observations & SDGs



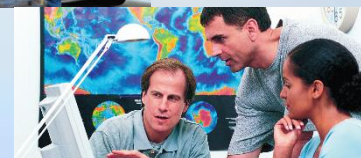
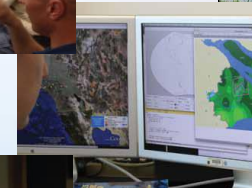
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NASA offers hands-on training courses to build skills in accessing and using Earth observations data through computer-based sessions for professionals.

We will design ones specific to SDG topics and audiences.

- *Webinars*
- *In person*
- *Introductory*
- *Advanced*

Air Quality
Water Resources
Flooding
Ecosystems
Drought
Land Management
Conservation
Health (new in 2016)
Others TBD



2015: 11 Trainings with 2,877 Participants,
123 Countries and 1,021 Organizations

Training: Earth Observations & SDGs



THE GLOBAL GOALS
For Sustainable Development

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Air Quality
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Health (new in 2016)
Others TBD

**Which topics
does UNSC
suggest for
2016-2017 ?**

2015: 11 Trainings with 2,877 Participants,
123 Countries and 1,021 Organizations



UN-GGIM
UNITED NATIONS INITIATIVE ON
GLOBAL GEOSPATIAL
INFORMATION MANAGEMENT

GEO GROUP ON
EARTH OBSERVATIONS



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GEO Initiative 18:

Earth Observations in Service of the 2030 Agenda for Sustainable Development



Geospatial Information and Earth Observations: Supporting Official Statistics in Monitoring the SDGs



UNSC STATISTICAL-GEOSPATIAL INTEGRATION FORUM
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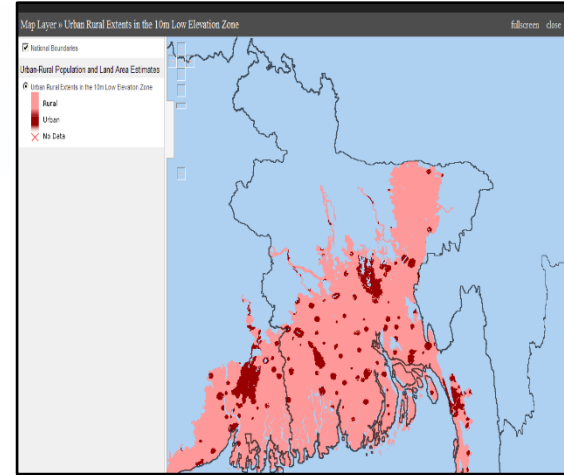
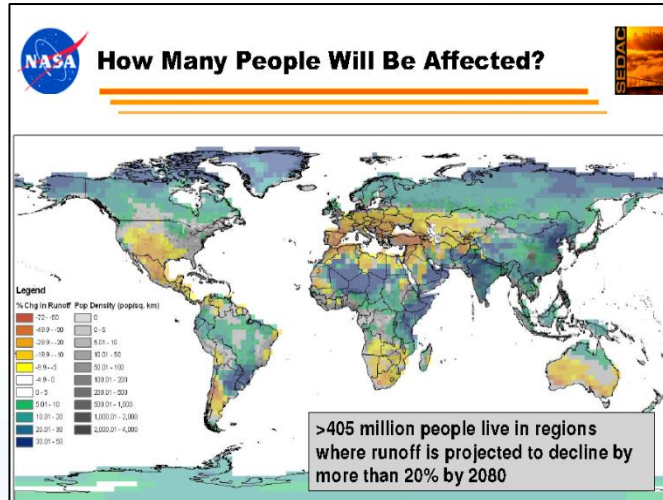
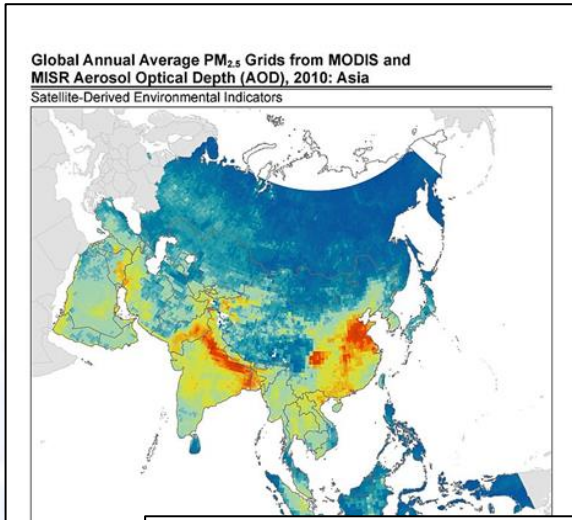
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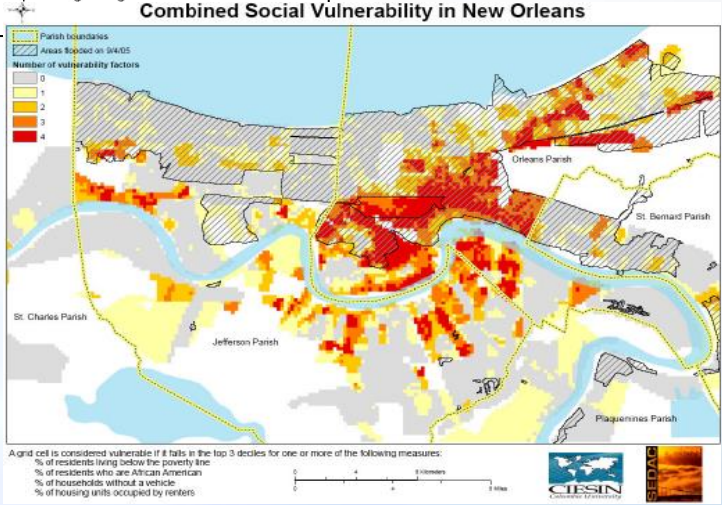
Session III. Geospatial and Earth Observations Data as Inputs to the Indicators

Additional Materials

Data models that use gridded population data



erbinin (2009). The impact of climate change on the spatial distribution of
Proceedings of the Expert Group Meeting on Migration. New York: UN





Indicator 15.1.1

Forest area as a percentage of total land area



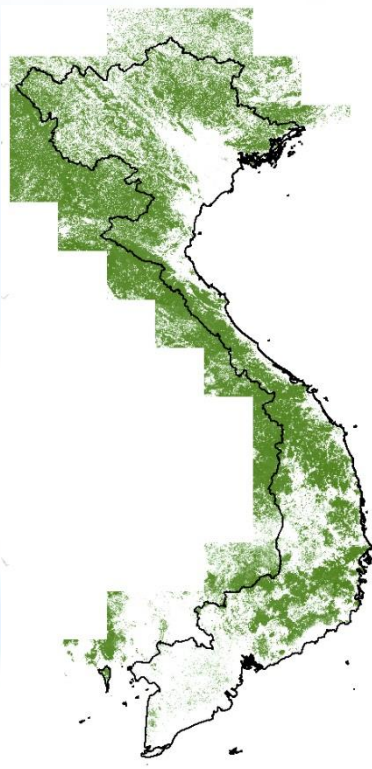
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Target 15.1

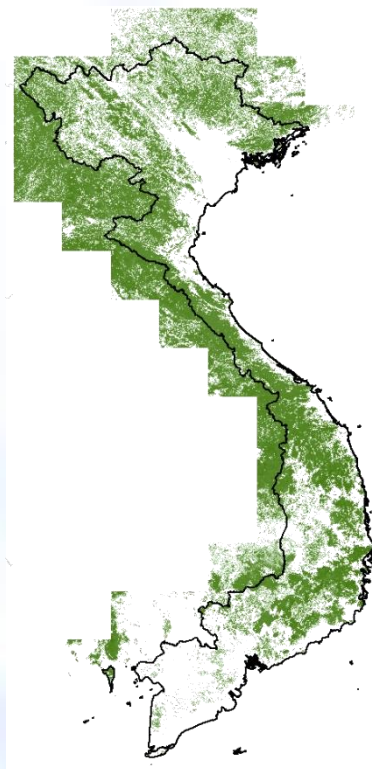
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Vietnam: Forest Cover Mapping

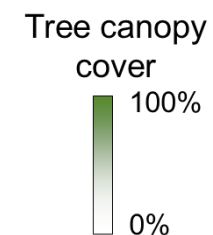
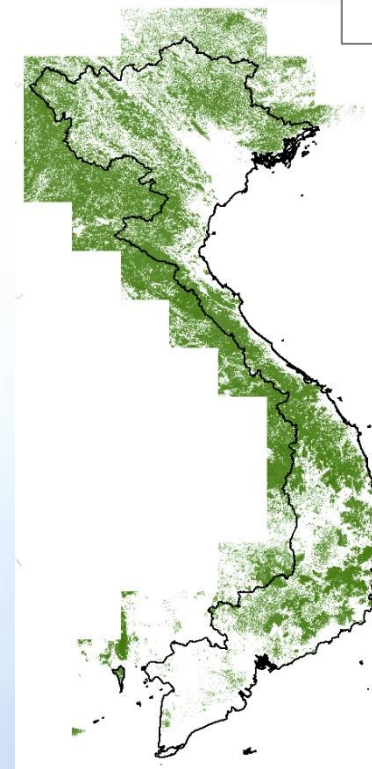
2000



2006



2014



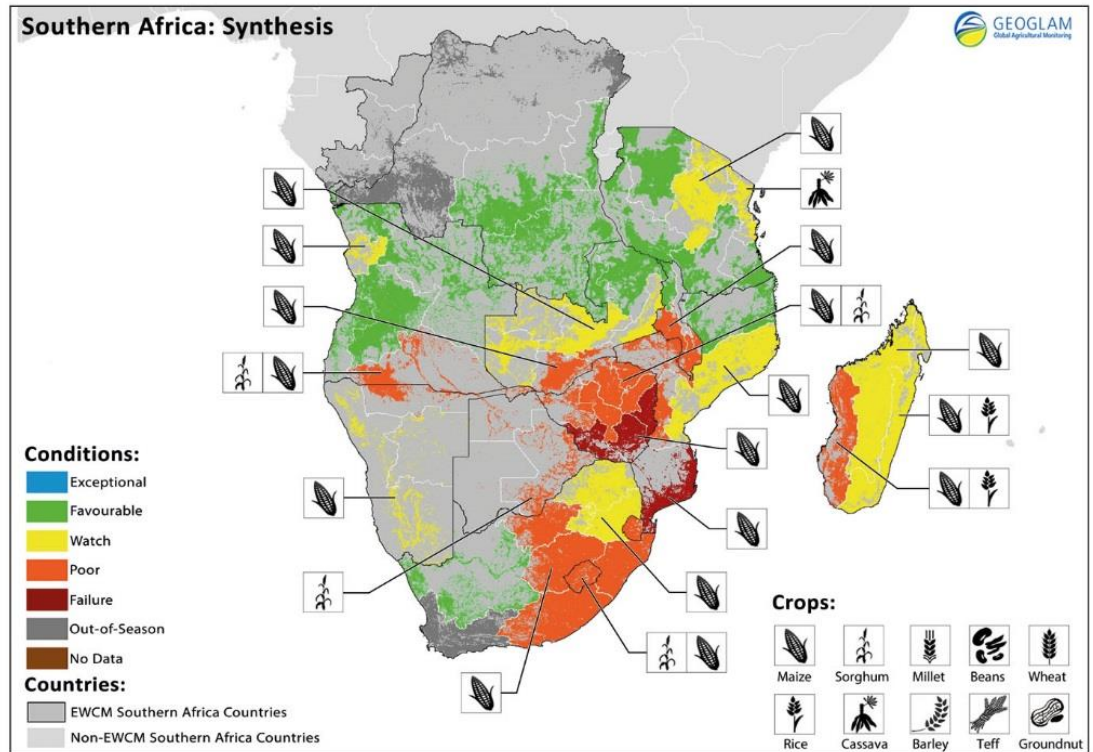


Target 2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.

MONITORING CROP CONDITIONS WITHIN COUNTRIES AT RISK OF FOOD INSECURITY

Crop condition map synthesizing information for all Early Warning Crop Monitor (EWCM) crops. Crop conditions over the main growing areas are based on a combination of national and regional crop analyst inputs along with Earth observation data. Crops that are in other than favourable conditions are displayed on the map with their crop symbol.

“Development planning and SDG outcomes can be visualized with maps.” (CIESIN)

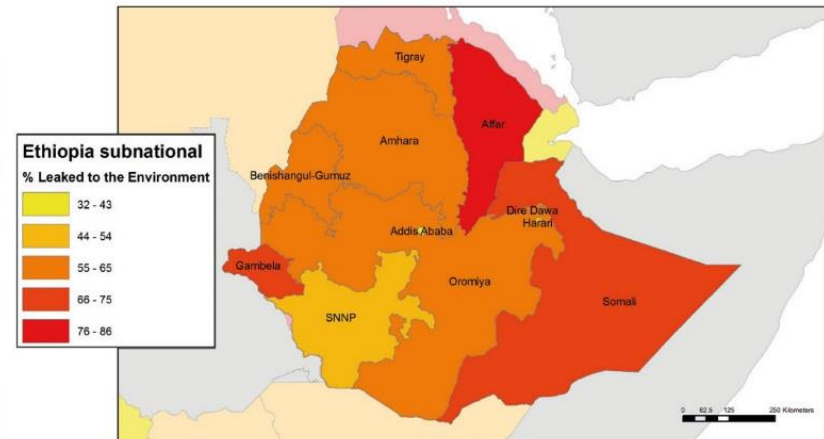
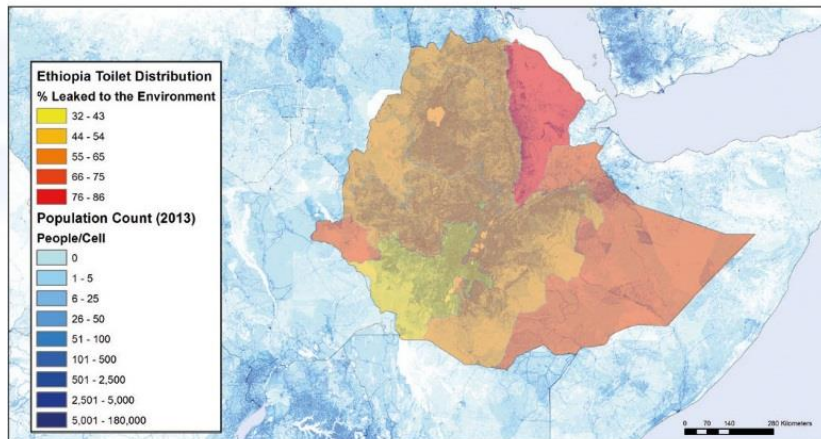


6 CLEAN WATER AND SANITATION



Target 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing the least hazardous chemicals and materials, halving the proportion of untreated waste water and substantially increasing recycling and safe reuse globally.

POPULATION DENSITY OVERLAID ON UNTREATED WASTEWATER LEAKING TO THE ENVIRONMENT, ETHIOPIA SUB NATIONAL



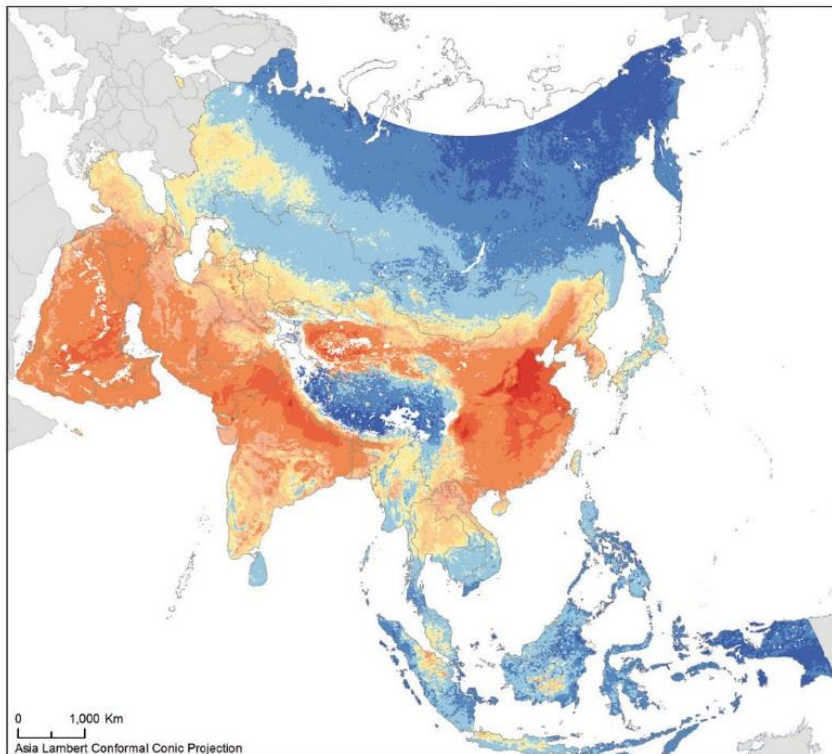
Integrating data from Earth observations and geospatial information with national surveys to monitor the impact of untreated wastewater on the population. The map on the left shows the extent of leakage of wastewater, excreta and grey water, with areas in red denoting extensive pollution. The map on the right integrates all data and shows where there is high impact, i.e., high leakage in densely populated areas.

11 SUSTAINABLE CITIES AND COMMUNITIES



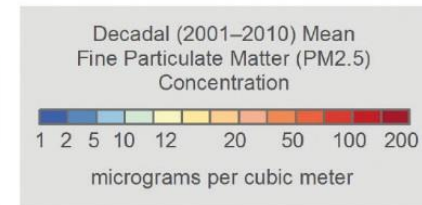
Target 11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.

MEASURING AIR QUALITY IN CITIES AND ACROSS REGIONS



Global Annual PM2.5 Grids from MODIS, MISR and SeaWiFS Aerosol Optical Depth (AOD), 2001–2010: Asia

Measurements from satellites provide information on air quality in communities and regions. For example, this map shows baseline data on particulate matter that could be used by statistical agencies, public health organizations, and environmental protection officials to develop more in-depth indicators, for example by deploying sensor networks to efficiently generate complete national data in near real-time.



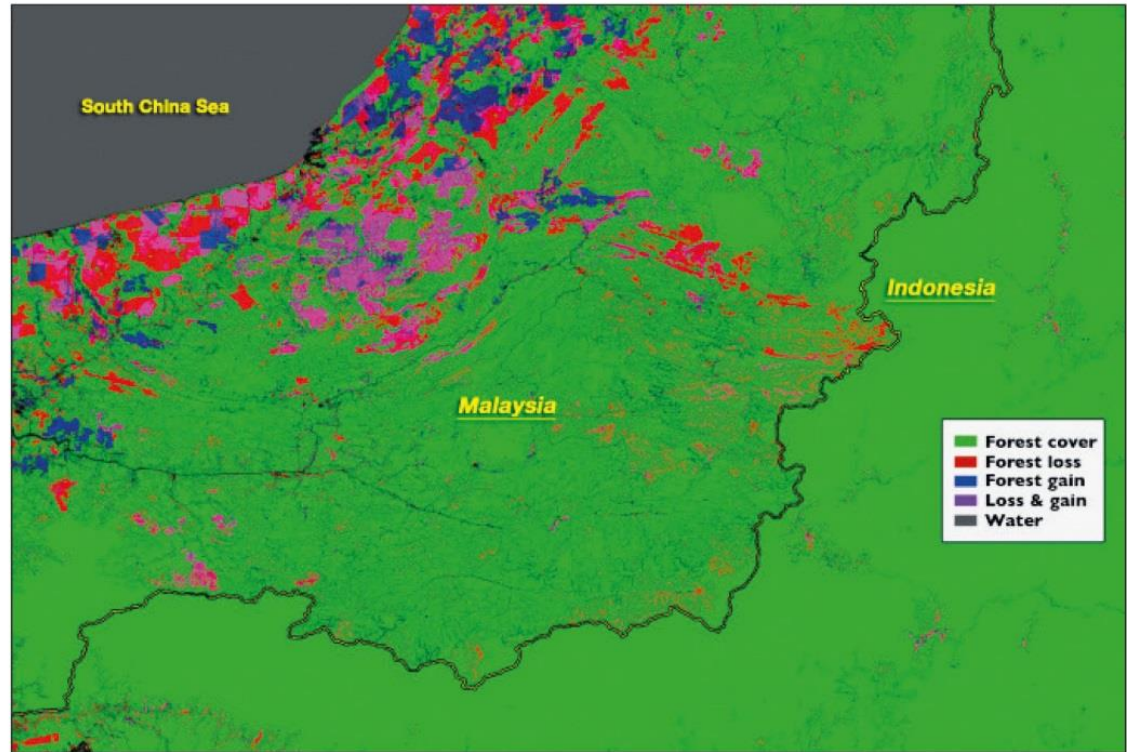
15 LIFE ON LAND



Target 15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.

EARTH-OBSERVING SATELLITES CAN TRACK TREE COVER EXTENT AND FOREST LOSS AND GAIN OVER TIME

The border between Malaysia and Indonesia on the island of Borneo stands out in the Landsat-based map of forest disturbance. Red pixels represent forest loss between 2000 and 2012.



“Mapping SDG-related data will improve measuring and monitoring of progress toward the SDG Indicators.”