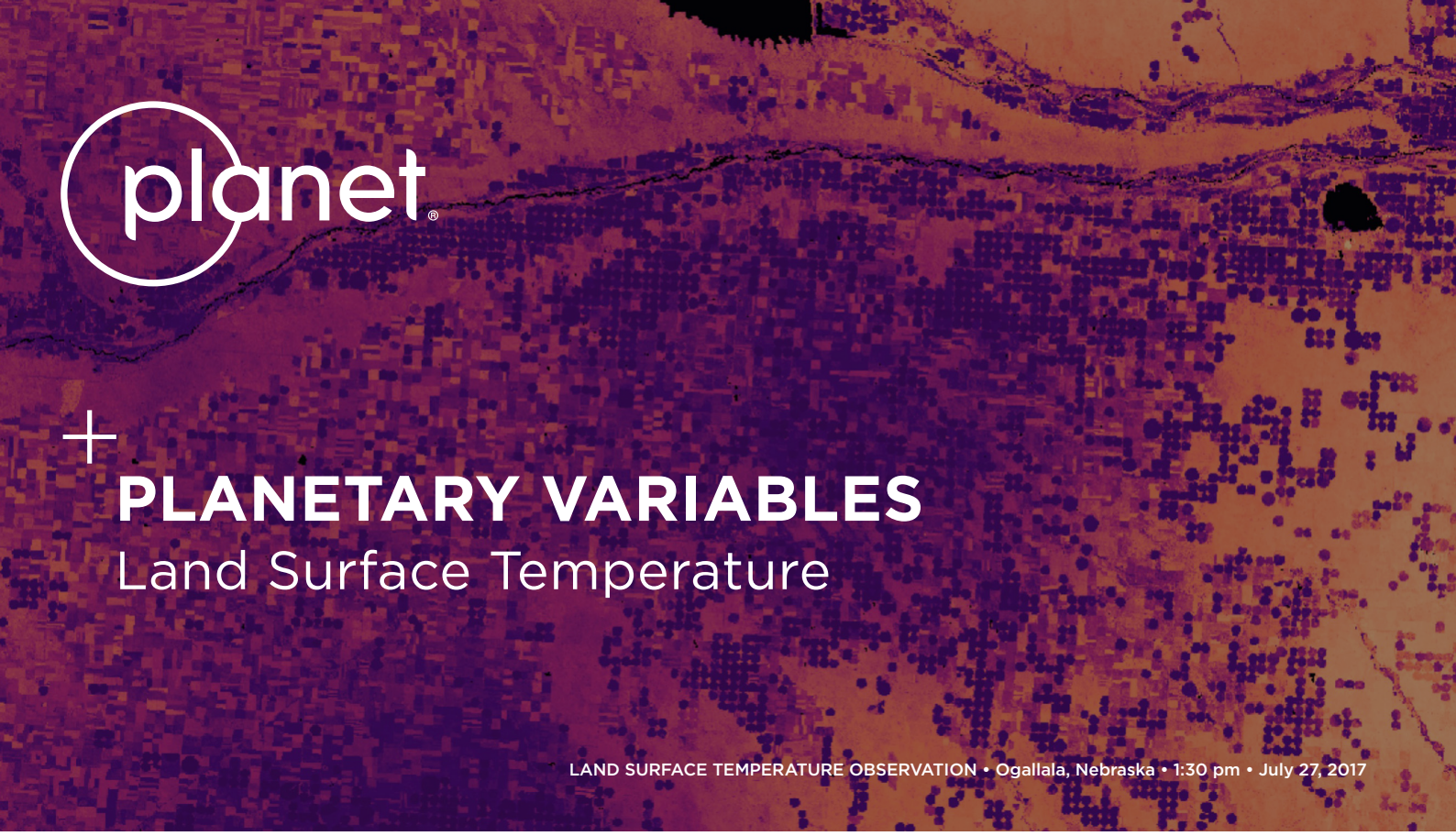


+ PLANETARY VARIABLES
Land Surface Temperature

OVERVIEW

Earth's changing climate is driving massive pressures on the planet's ecosystems and the human livelihoods that depend on them. Tracking and responding to those pressures is not an easy task, especially without reliable, scalable, and consistent sources of data. Planet's Land Surface Temperature (LST) is a feed of high-resolution, globally available measurement of the skin temperature of the surface of the Earth. Combining observations from a range of satellite constellations, Land Surface Temperature delivers continuous and scientifically reliable data, providing vital intelligence about our atmosphere, food and water systems, and urban living conditions.

CONTINUOUS COVERAGE

Get twice-daily measurements unhindered by clouds or darkness to enhance model building and stay on top of changing conditions

DEEP DATA ARCHIVE

Draw from a consistent archive of historical data reaching back 20+ years to build a reliable foundation and compare against current conditions

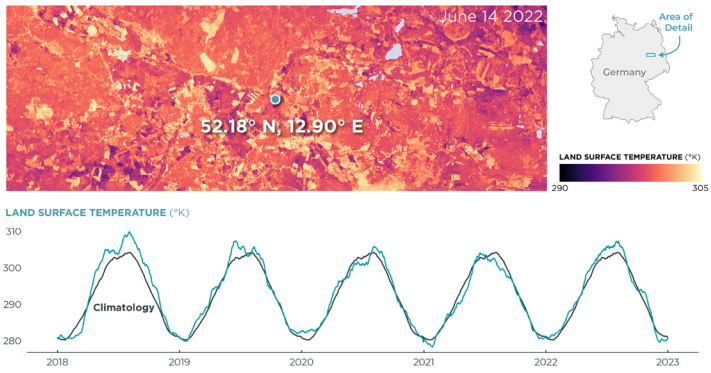
HIGH ACCURACY

Match the accuracy of ground sensors—with better spatial representation and no need for physical maintenance or field visits to collect data

7369

HOW IT WORKS

Planet's Land Surface Temperature provides a twice-daily measurement of the Earth's skin temperature at a global level. By combining overlapping observations from multiple public satellite sensors that measure passive microwave radiation from the earth surface, Planet creates downscaled Land Surface Temperature observations. Initial observations represent several kilometers of the Earth's surface in any given pixel of data, but Planet's Land Surface Temperature delivers data at much finer scales, at 1 km and 100 m spatial resolutions. The 100 m product also includes optical data from the Sentinel-2 constellation, where the shortwave infrared and near-infrared bands provide data that further downscales the resolution of the imagery.

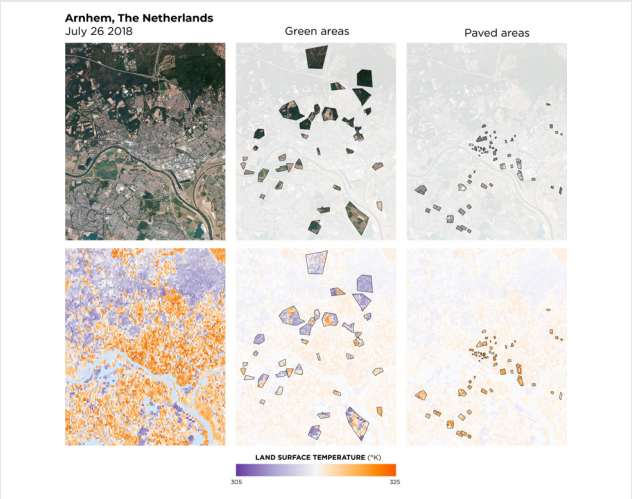


Measurements of Land Surface Temperature southeast of Berlin, Germany. The image above represents the skin temperature from a single day, with each pixel representing a 100 x 100 meter area. Below, the measurements of Land Surface Temperature of a single point are plotted over 5 years with the baseline climatology, showing how temperature levels compare to the expected average for the area.

USE CASES ACROSS INDUSTRIES

Urban Heat Island

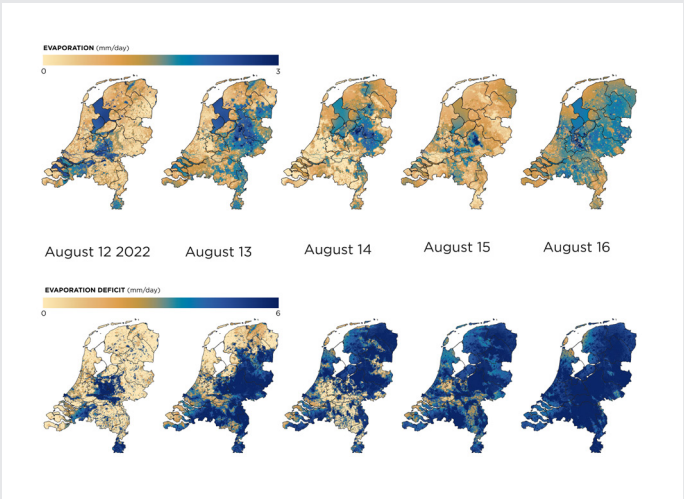
Planet's Land Surface Temperature data can improve Urban Heat Island monitoring with a granularity that helps model neighborhood-to-neighborhood differences daily. Because LST data covers massive areas with consistency, models powered by LST data can benchmark heat from one city against similar locations—helping gauge the effectiveness of interventions.



A spatial analysis with Planet LST shows the UHI effect in the city of Arnhem, The Netherlands during a hot summer day (July 26, 2018). Paved urban areas show higher temperature differences than more vegetated areas.

Weather & Climate Modeling

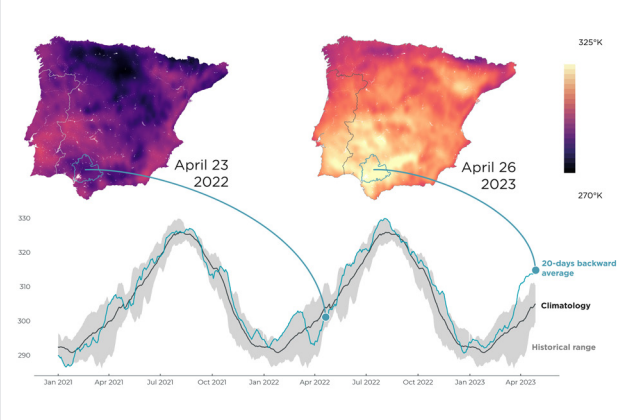
Land Surface Temperature (LST) data is essential in weather and climate models as it helps in understanding and predicting the impacts of climate change on surface temperature patterns, heatwaves, and the overall energy balance of the Earth's system. With Planet's LST data, meteorological agencies get more consistent measurements of temperature, which can help improve their models to predict weather and climate conditions with higher accuracy and responsiveness



Actual evaporation and evaporation deficit across the Netherlands for selected days during the summer of 2020, delivered in a daily operational service to the Dutch Water Boards. Accurate Land Surface Temperature is a key input variable to estimate evaporation of water from the surface, which is a valuable metric used to manage and plan water resources.

Drought & Heatwave Monitoring

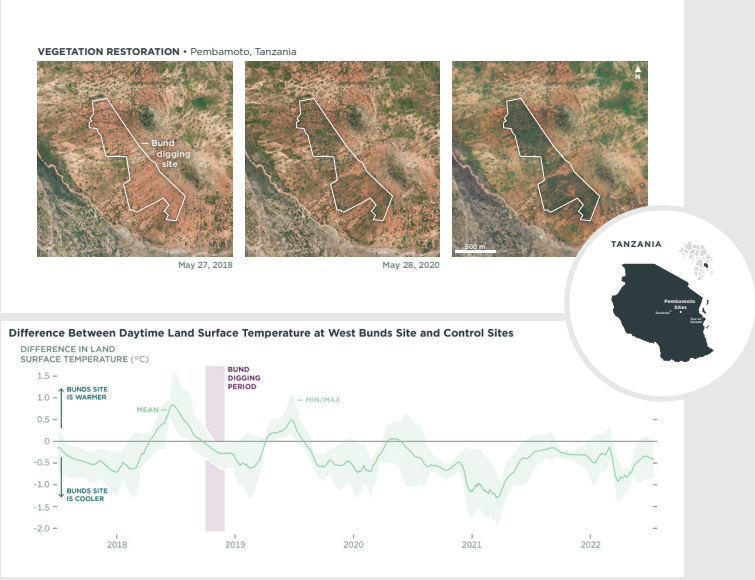
Planet's LST helps monitor hot and dry conditions and track the feedback loop of drought—as soil becomes drier, it becomes warmer. The relationship between soil moisture and temperature can indicate the severity and extent of drought conditions and the effect it has on crops, ecosystems and the human population.



In April 2023, Spain faced historical high temperatures during a critical period of the growing season. Over the province of Seville, Planet LST measured up to +10.5°C above normal temperatures, making it the warmest April in the last 10 years. The climatology and the historical range were calculated for the period 2013-2022 (10 years).

Environmental Impact Monitoring

Organizations with environmental targets seek ways to monitor their progress and quantify their impact. Land Surface Temperature, among other Planetary Variables can be used to capture landscape changes due to intervention activities (e.g. reforestation) and the impact those changes have on the climate of the region (e.g. cooling down).



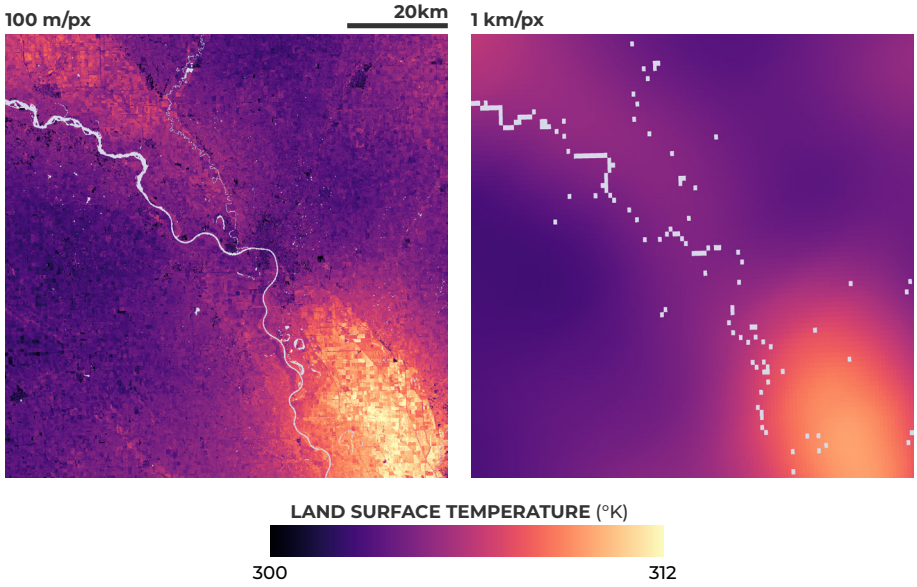
PlanetScope imagery captured Justdiggit's vegetation restoration in Pembamato, Tanzania. This region shows a dramatic change in vegetation growth from 2018 to 2022 thanks to the creation of bunds (semi-circular shaped pits that help the soil capture rainwater). The time series below visualizes the differences between the daytime Land Surface Temperature of the bunds (intervention sites) and selected control areas. The bunds have cooled down the top soil up to 0.75 degrees Celsius, depending on seasonal vegetation patterns.

Crop Stress & Productivity

When a plant experiences heat or water stress, it stops evaporating and the temperature of its leaves increases. The elevated temperature of the vegetation surface can be monitored using Planet's Land Surface Temperature product. Agriculture companies can use LST to build consistent models for monitoring crop stress and crop productivity. With LST's high temporal resolution and spatial granularity, customers can offer better advice to their growers, especially around the timing of key events, sowing and harvesting.

Commodity & Yield Prediction

Commodity buyers and traders forecast crop yields and the quality of crops based on a correlation of historic yields and climatic data. The Planetary Variables—Soil Water Content, Land Surface Temperature, and Vegetation Optical Depth (a byproduct of these two)—supply direct measurements of the most important factors impacting yield. Field checks can be reduced or eliminated when monitoring regional crops from space.



SPECIFICATIONS

	100 m Resolution	1 km Resolution
Temporal Resolution	Above 50 degrees latitude: 2 observations daily at 1:30 am and 1:30 pm (±730 observations annually). At the equator: at least ±180 1:30 am and ±180 1:30 pm observations annually; (at least ±360 observations annually in total).	
Data Availability	July 2017 - Present	June 2002 - October 2011 (AMSRE) August 2012 - Present (AMSR2)
Pixel Size	100 x 100 meters	1,000 x 1,000 meters
Satellites Used	AMSR-2 Sentinel 2	AMSR-E (June 2002 - October 2011) AMSR-2 (August 2012 - Present)
Unit	Kelvin (K)	
Sensing Depth	Skin temperature	
File Format	GeoTiff	
Spatial Coverage	Global	
Latency from Observation to Availability	+/- 12 hours after overpass of the satellites	

GET IN TOUCH

We're Here to Help
Get answers to technical questions about Planet products
support.planet.com

Contact Us
Learn how Planet can help you turn data to actionable insights
go.planet.com/getintouch

Learn More
go.planet.com/planetaryvariables