

Google

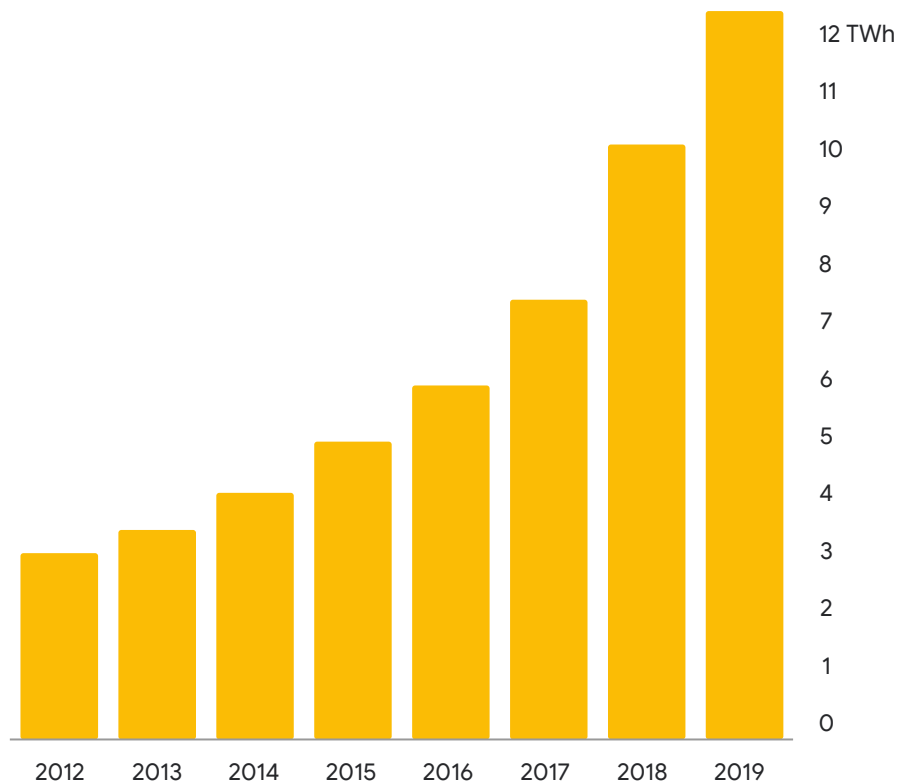
24/7 carbon free energy and energy storage backup at data centers



Google's annual electricity consumption

Demand for our services is growing every year, driving continued growth in our energy use

● Total electricity consumption (TWh)





In 2019, Google
used more electricity
than the entire state
of **Hawaii**

21

locations for
owned and
operated
data centers

4

continents



Americas

Berkeley County, South
Carolina
Council Bluffs, Iowa
The Dalles, Oregon
Douglas County, Georgia
Henderson, Nevada

Jackson County, Alabama
Lenoir, North Carolina
Loudoun County, Virginia
Mayes County, Oklahoma
Midlothian, Texas

Montgomery
County, Tennessee
New Albany, Ohio
Papillion, Nebraska
Quilicura, Chile

Europe

Dublin, Ireland
Eemshaven, Netherlands
Fredericia, Denmark
Hamina, Finland
St Ghislain, Belgium

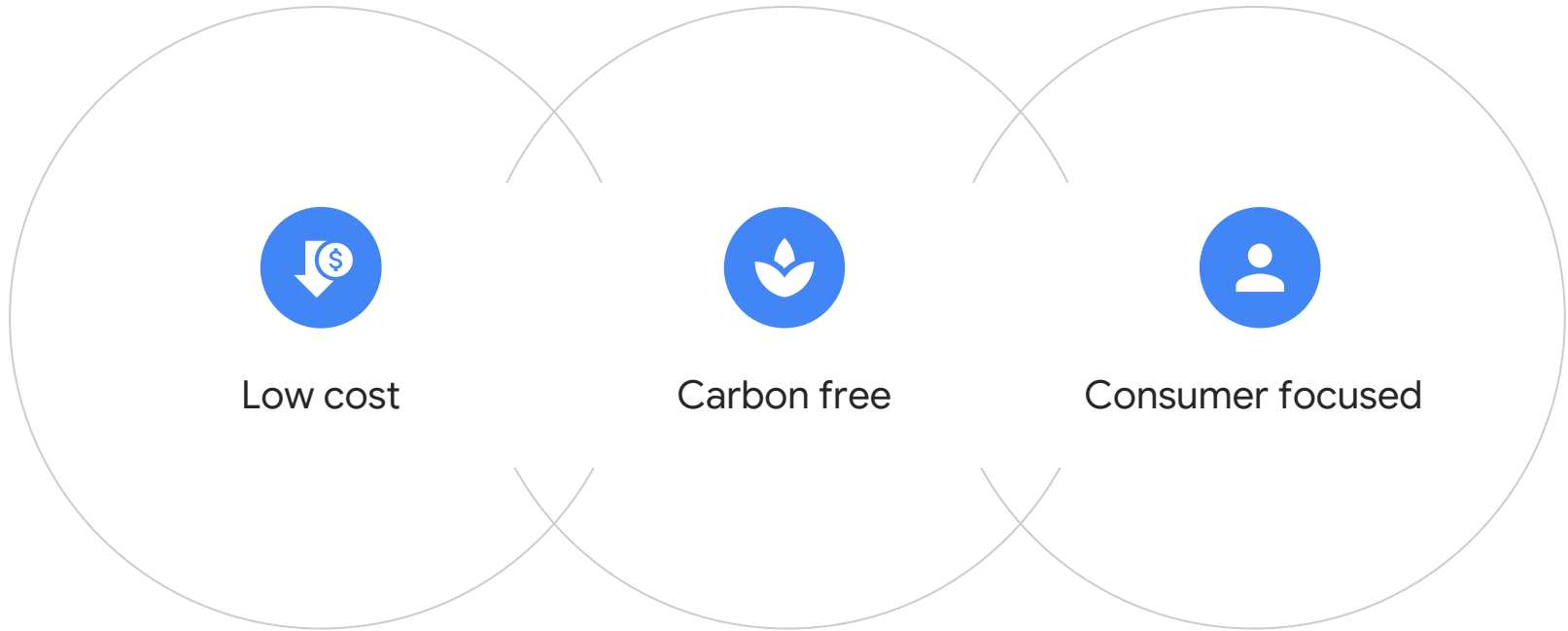
Asia

Changhua County, Taiwan
Singapore



Our objectives

Our objectives



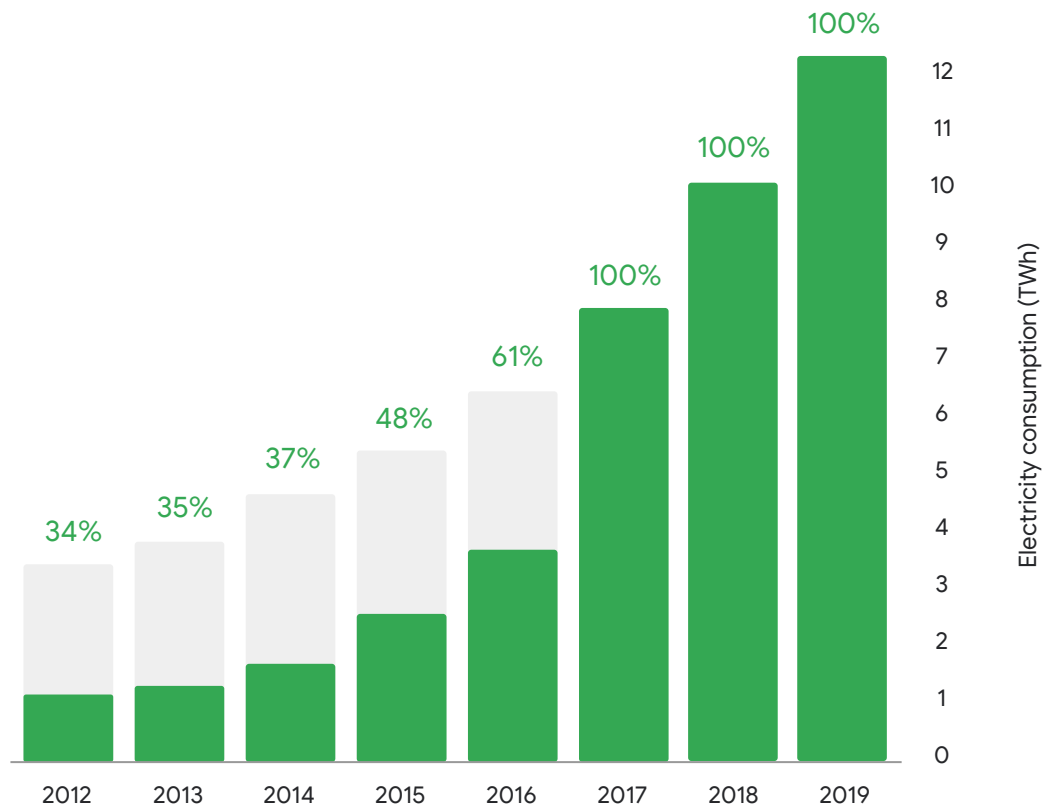
An aerial photograph of a large wind farm situated on rolling green hills. Numerous white wind turbines are scattered across the landscape, which is crisscrossed by winding roads and power lines. The terrain is lush and green, with some areas appearing darker, possibly due to shadows or different vegetation types. The overall scene conveys a sense of sustainable energy production in a natural setting.

Google is one of the world's
largest corporate
purchasers of
renewable energy

Google

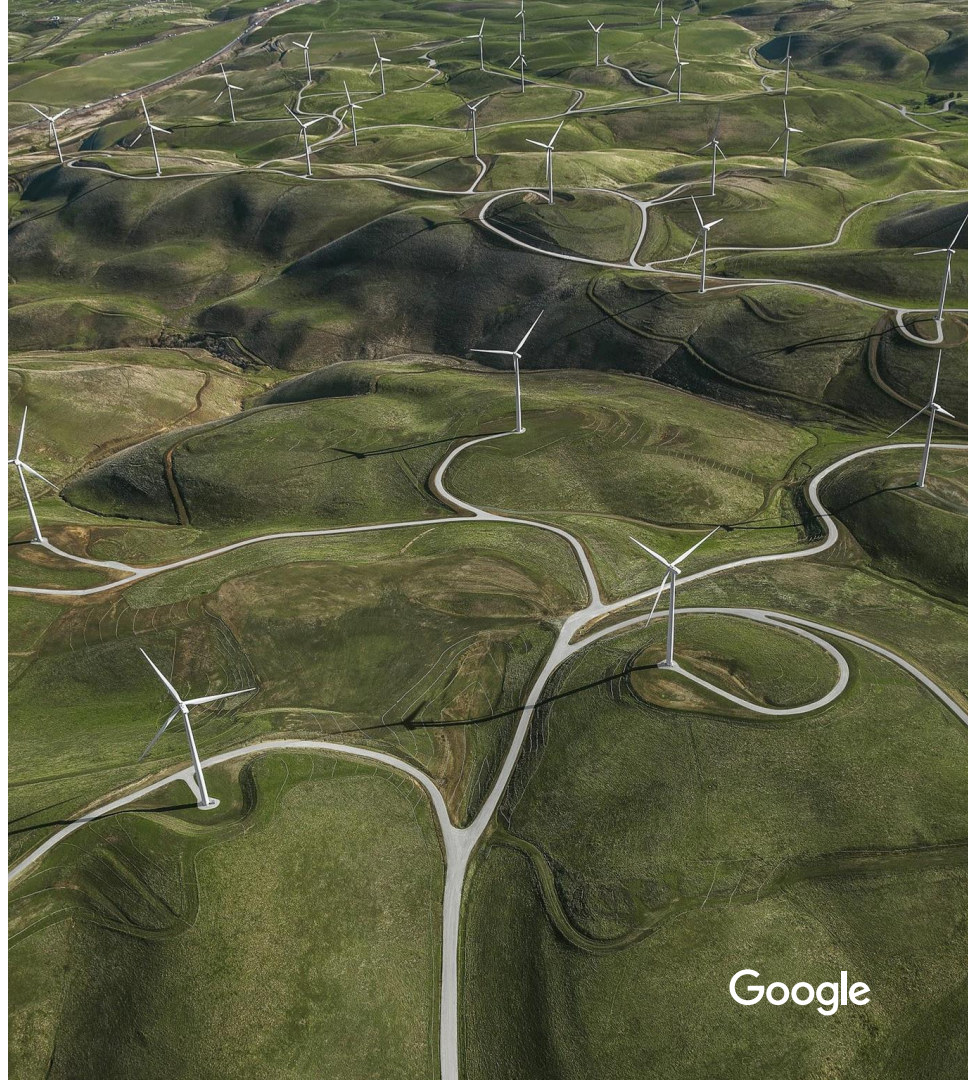
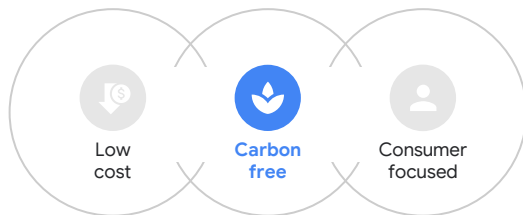
Renewable energy purchasing compared with total electricity use

- Total electricity consumption
- Renewable energy



What we're doing

24/7 Clean Energy



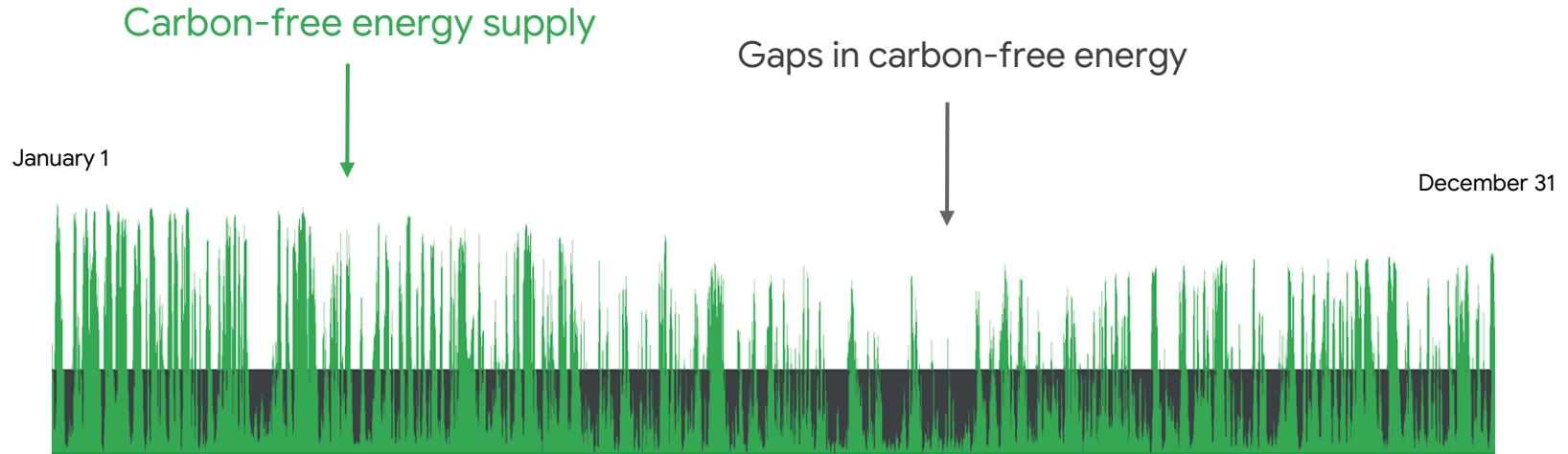
Google

A world map with a blue background. The landmasses are in a darker blue. Numerous white dots of varying sizes are scattered across the map, representing Google's global presence. There is a high concentration of dots in North America, particularly in the United States. Other clusters are visible in Europe, Asia, and South America. The text "Beyond 100% renewable" is centered over the map.

Beyond 100% renewable

Sourcing clean energy for Google's operations **in all places, at all times**

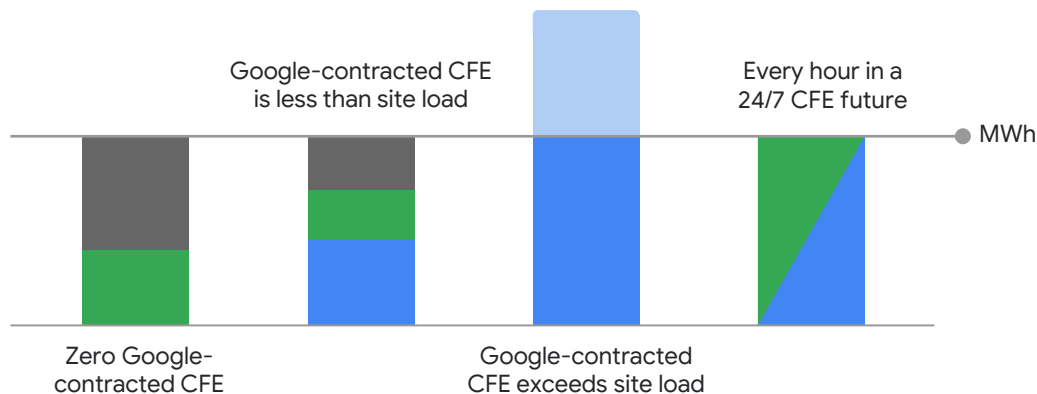
Hourly carbon-free energy performance at an example data center



Iowa data center hour by hour (2018)

Hourly scenarios in our carbon-free energy framework

- Grid carbon-based energy
- Grid carbon-free energy (CFE)
- Google-contracted CFE
- Excess Google-contracted CFE



What about
energy storage
backup at data
centers?

Cleaner backup power to
enable 24/7 CFE

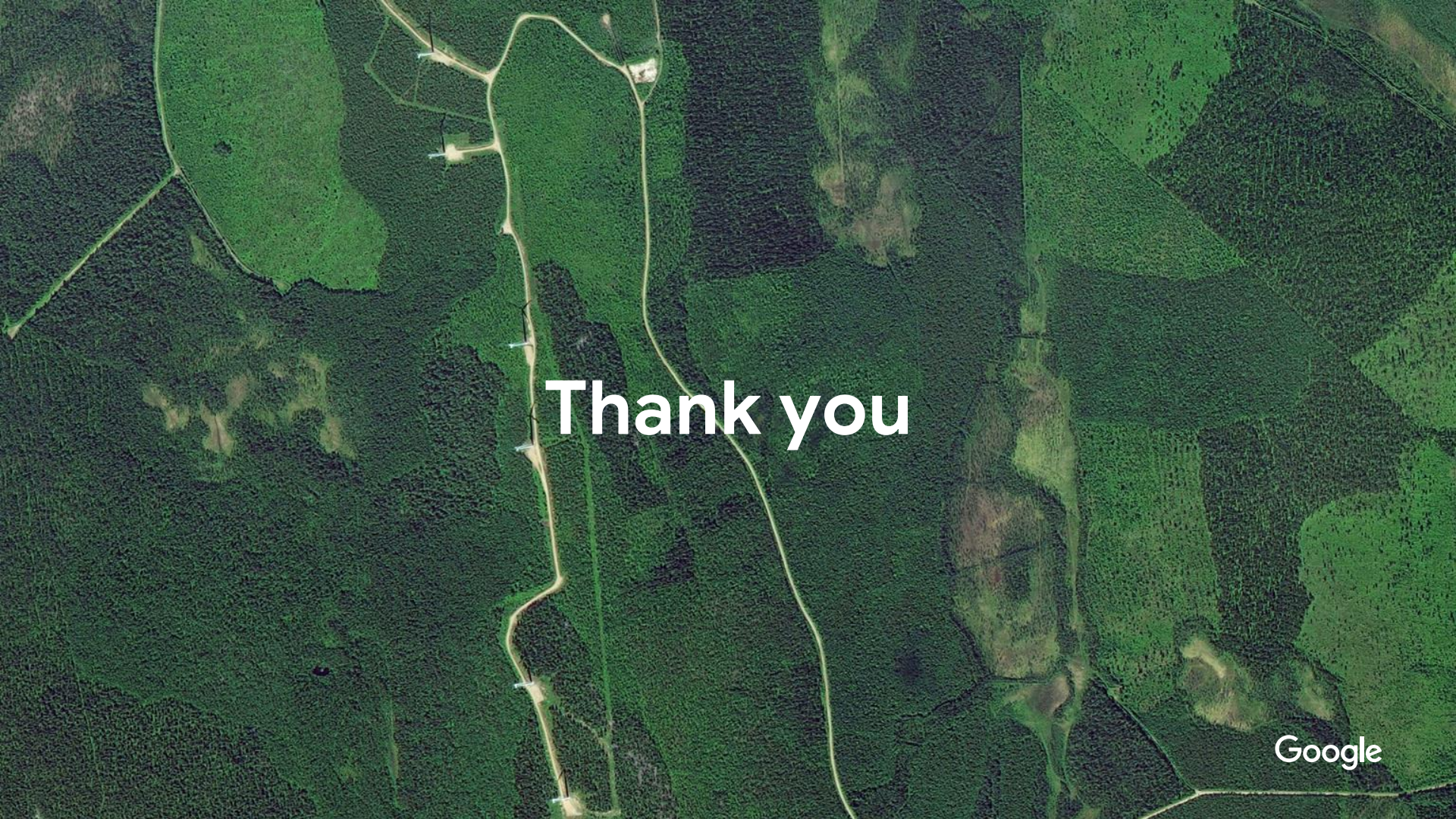
First-ever

battery backup system
for generator
replacement at a
hyperscale data center

Flexible capacity

provided to grid, paving the
way toward a clean energy
future



An aerial photograph of a dense green forest. A light-colored, winding path or road cuts through the trees, starting from the bottom left and moving towards the top center. A small, light-colored building is visible near the top of the path. The forest is composed of various shades of green, indicating different types of trees or vegetation.

Thank you

Google