Harnessing the Data Revolution for Climate Resilience – NASA's Role

Dr. Gale Allen
NASA Deputy Chief Scientist

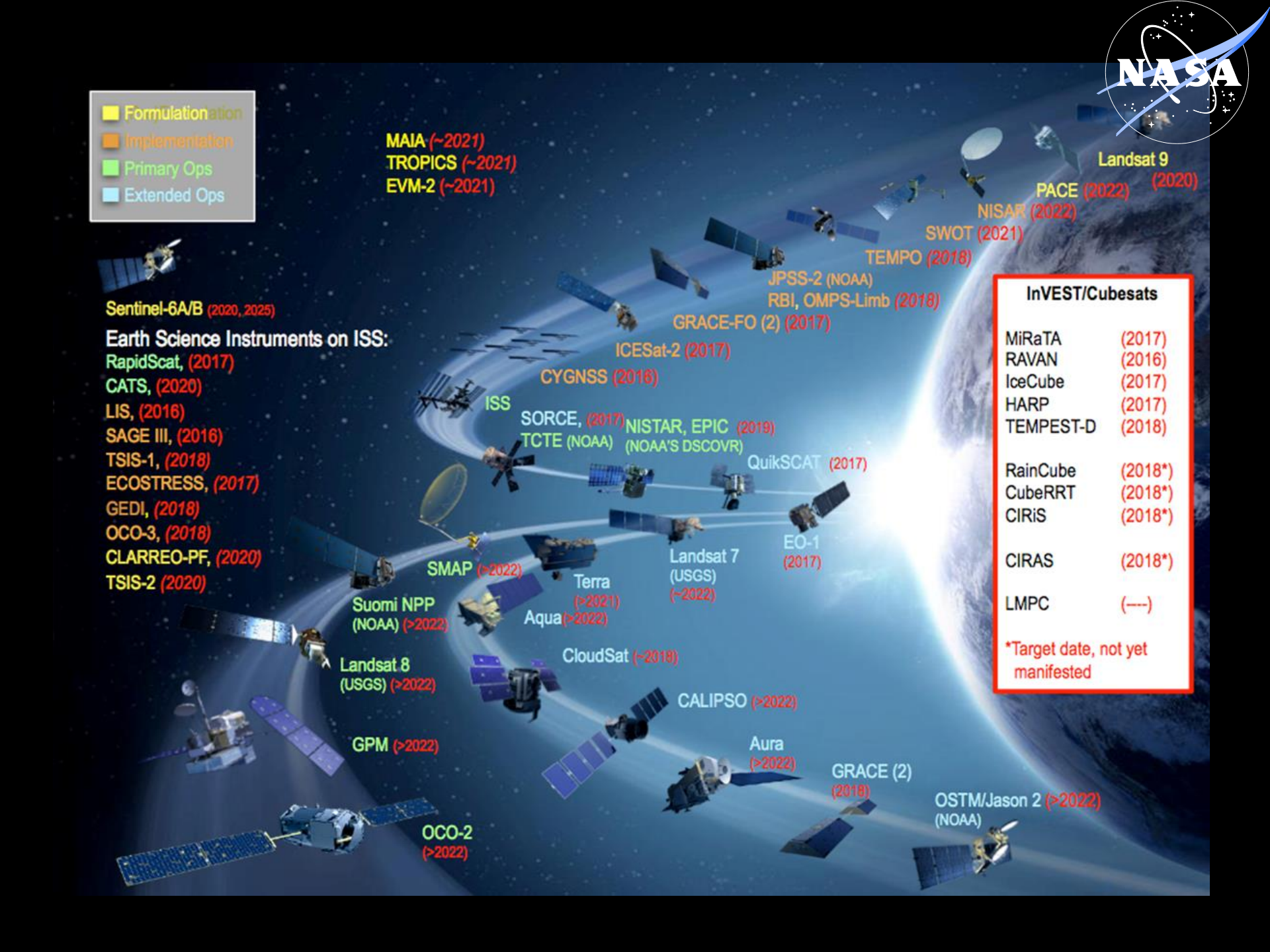
Climate Data Initiative

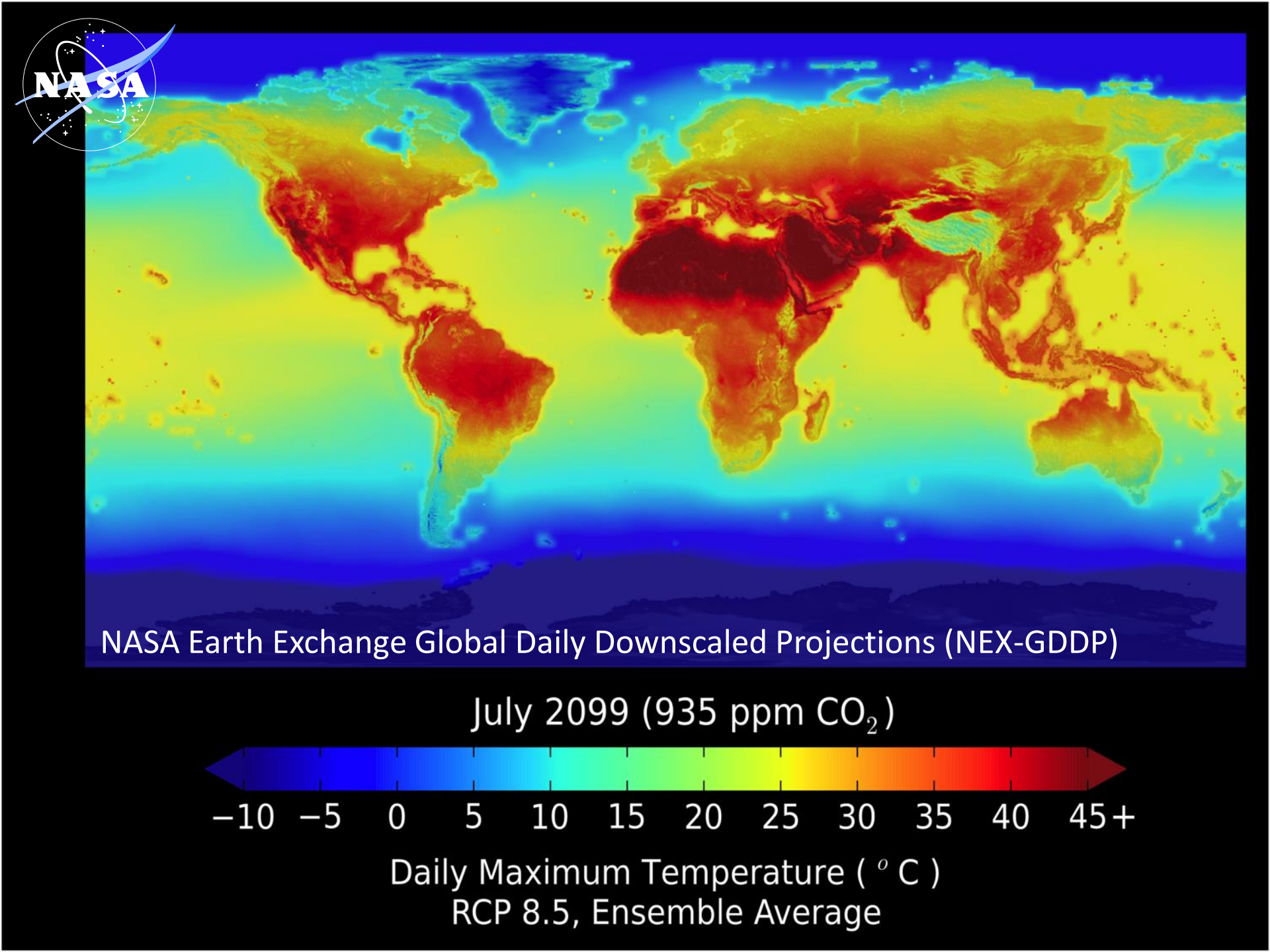
From the President's Climate Action Plan

Over 700 data Sets in 9 thematic areas

Across Federal Agencies

climate.data.gov

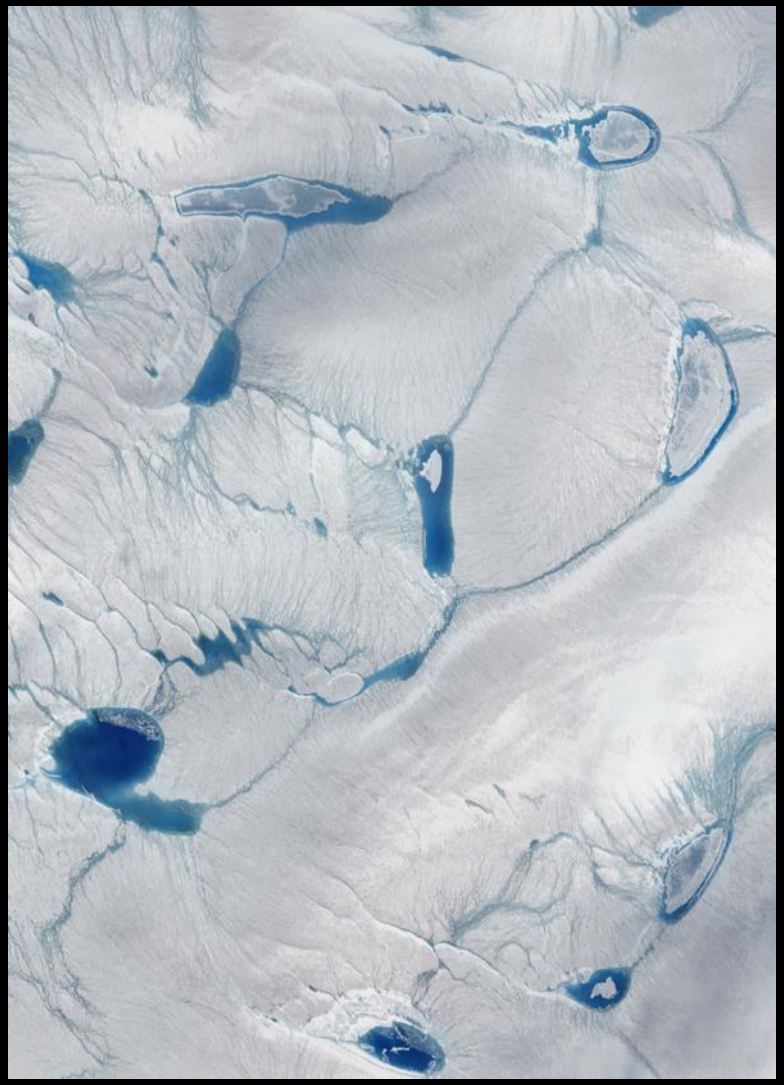

Formulation
Implementation
Primary Ops
Extended Ops
MAIA (~2021)
TROPICS (~2021)
EVM-2 (~2021)
Sentinel-6A/B (2020, 2025)
Earth Science Instruments on ISS:
RapidScat, (2017)
CATS, (2020)
LIS, (2016)
SAGE III, (2016)
TSIS-1, (2018)
ECOSTRESS, (2017)
GEDI, (2018)
OCO-3, (2018)
CLARREO-PF, (2020)
TSIS-2 (2020)
Landsat 9 (2020)
PACE (2022)
NISAR (2022)
SWOT (2021)
TEMPO (2018)
JPSS-2 (NOAA)
RBI, OMPS-Limb (2018)
GRACE-FO (2) (2017)
ICESat-2 (2017)
CYGNSS (2016)
ISS
SORCE, (2017)
TCTE (NOAA)
NISTAR, EPIC (2019)
(NOAA'S DSCOVR)
QuikSCAT (2017)
EO-1 (2017)
Landsat 7 (USGS) (~2022)
SMAP (>2022)
Terra (>2021)
Aqua (>2022)
Suomi NPP (NOAA) (>2022)
CloudSat (~2018)
Landsat 8 (USGS) (>2022)
CALIPSO (>2022)
GPM (>2022)
Aura (>2022)
GRACE (2) (2018)
OSTM/Jason 2 (>2022) (NOAA)
OCO-2 (>2022)
InVEST/Cubesats
MiRaTA (2017)
RAVAN (2016)
IceCube (2017)
HARP (2017)
TEMPEST-D (2018)
RainCube (2018*)
CubeRRT (2018*)
CIRiS (2018*)
CIRAS (2018*)
LMPC (----)
*Target date, not yet manifested


NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP)
July 2099 (935 ppm CO_2)
−10 −5 0 5 10 15 20 25 30 35 40 45+
Daily Maximum Temperature (^{o} C)
RCP 8.5, Ensemble Average

Monitoring Change: Melting Icecaps

Greenland

June 10, 2014



June 15, 2016

Monitoring Change: Natural Disasters

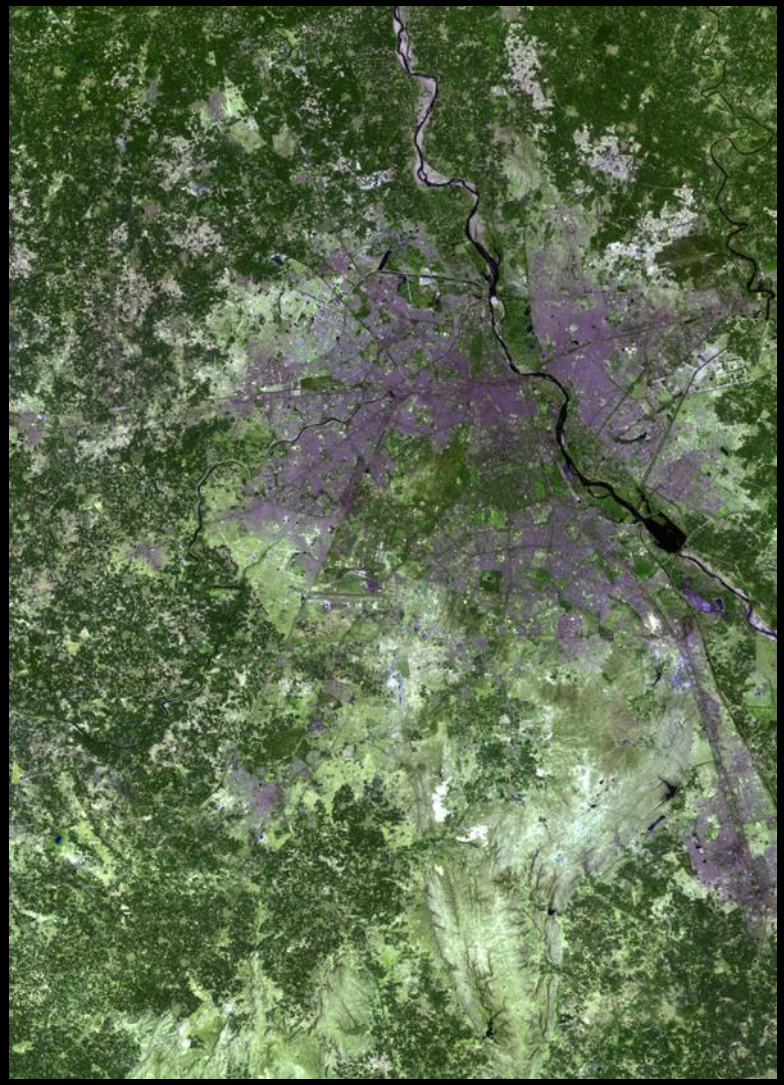
Cambodia: Typhoon Nari Flooding

May 17, 2013

October 24, 2013

Monitoring Change: Urban Growth

New Delhi

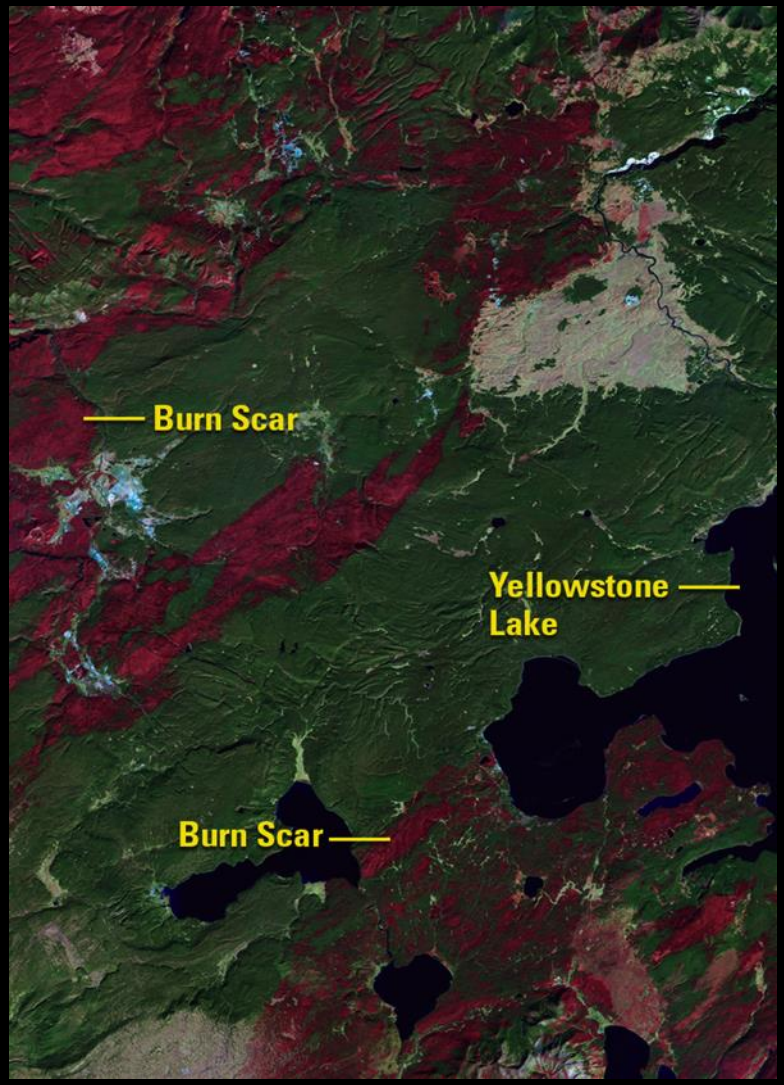


March 14, 1991

March 2, 2016

Monitoring Change: Fire and Recovery

Yellowstone National Park



October 10, 1988

June 17, 2016

National Aeronautics and Space Administration

From Space to Earth:
Solutions for
Global Challenges

NASA Technologies Benefiting the Developing World

How do you provide clean electricity to areas without any at all? How do you purify air and water and supply the nutrients necessary for good health when resources are scarce? How do you provide medical care when the nearest doctors and hospitals are miles away?

These questions apply both in space and on Earth. While overcoming the challenges of space exploration, the U.S. National Aeronautics and Space Administration (NASA) often discovers answers to similar problems here at home. Working with partners, NASA transfers the fruits of its research and development to people in need of innovative solutions to issues impacting health, environment, and quality of life. In this way, the benefits of investing in technological innovation multiply across the globe—generating economic growth and improving life on Earth.

Solutions for Global Challenges

Staying Warm with One Lightweight, Inexpensive Material

The same radiant barrier insulation technology used on every NASA space mission is now made into a thin, lightweight blanket to keep people warm. The thin blankets are made in an environmentally friendly, recyclable form and reflect up to 97 percent of a person's radiant heat, providing an envelope of warm air around the body and an inexpensive means of countering hypothermia.

Keeping Structures Safer, Longer

To protect the buildings at its major launch facility, NASA developed a technique that sends corrosion-inhibiting ions through concrete and into steel rebar to prevent rust, corrosion, and separation of the rebar from concrete. The technology is available to prevent corrosion in concrete buildings, highways and bridges, piers and docks, and more—a cost-effective method for extending the lifespan of infrastructure and enhancing public safety.

A Sun-Powered Solution

Without proper thermal control, temperatures onboard the International Space Station could rise as high as 121 °C on the Sun-facing side and sink as low as -157 °C on the station's dark side. NASA research into battery-free, solar-powered refrigeration and air conditioning systems for space led to a commercial solar-powered refrigeration system now available globally. The technology provides a means not only for cooling food and drinks, but also for refrigerating needed medications and vaccines for communities without electricity, which encompass more than 1.5 billion people worldwide.

Solutions for Global Challenges

NASA has undertaken numerous missions over the years to expand knowledge of the Earth, universe, and beyond. The innovations that emerge from these efforts provide benefits that stretch beyond U.S. borders to reach around the world. Here are only a few of the many examples.

Clean Water Anywhere

The United Nations estimates that more than one in six people worldwide lack the necessary daily amount of safe water for drinking, cooking, and cleaning. That's more than 894 million people who stand to benefit from NASA water purifying technologies. One example is the microbial check valve unit—developed for the space shuttle and later flown to the International Space Station—that uses a regenerable iodine resin to disinfect water at very low cost. The technology has been incorporated into powerful water purification systems that can be readily deployed to remote areas and those without effective sanitation infrastructure.

Preserving Food, Saving Costs

One day, long duration space travel will require astronauts to cultivate their own food sources. NASA researchers developed a technology that removes a chemical from the air that speeds the decay of fruits and vegetables. This innovation also eliminates many airborne pathogens. Now available commercially, the device helps preserve produce on its way to and at the market, reduces food waste, increases the safety of food preparation areas, and provides air sanitation for doctors' clinics and operating rooms—all at an operating cost as little as U.S. $1 a day.

Healing the Toughest Wounds

Afflicting people in over 30 countries, Buruli ulcers cause horrific open sores that prove difficult to heal. While studying ways of treating astronauts for decompression sickness, NASA invented portable hyperbaric chamber technology that could bring the medical benefits of highly concentrated oxygen to those recovering from Buruli ulcers as well as other infections and injuries—wherever the patients are. The innovation is in the process of commercialization.

Solutions for Global Challenges

Emergency Communications in Two Suitcases

Internet access, voice over Internet protocol, e-mail, video teleconferencing, broadcast television—all through a portable system that fits in two storage cases and takes only 45 minutes to set up and 15 minutes to take down. This NASA-derived inflatable antenna technology provides an effective way to connect remote areas and provide essential communications in the wake of a disaster.

An Essential Nutrient from an Unlikely Source

Algae may not seem appetizing, but while researching food for astronauts on long space missions, NASA scientists discovered DHA (docosahexaenoic acid), previously only found in human breast milk, could be derived from certain strains of microalgae. DHA plays a key role in infant development and adult health, aiding mental development, vision, and the prevention and management of cardiovascular disease. It is currently available in infant formulas in over 65 countries.

NASA's Public Access Data Portal

www.nasa.gov/open/researchaccess