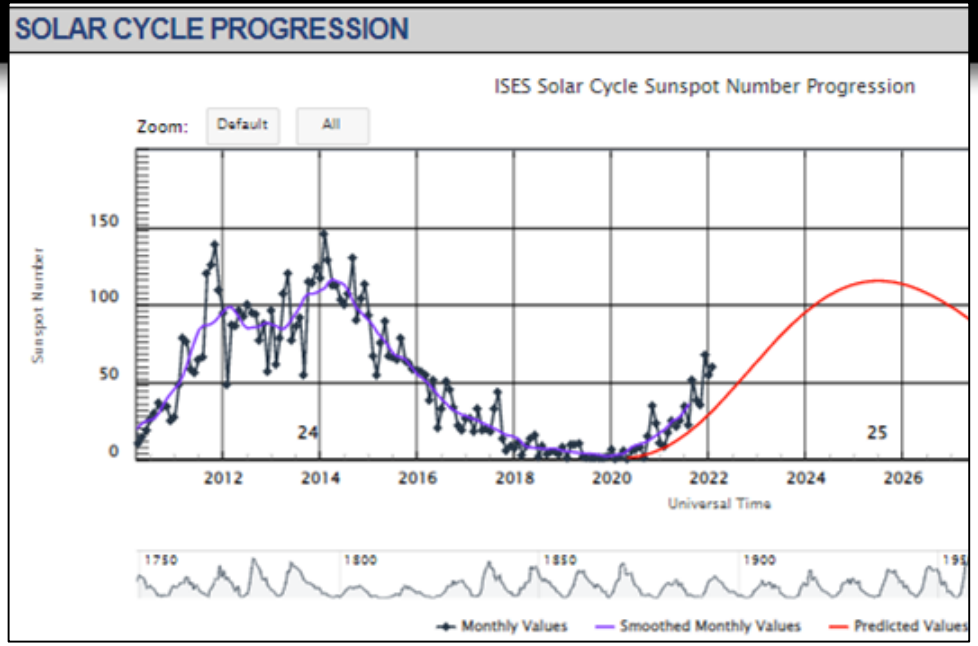
Committee on Solar and Space Physics
Update from NOAA SWPC - March 2022

Brent Gordon
NOAA National Weather Service
Space Weather Prediction Center
Space Weather Services Branch Chief
Wed, 23 March 2022

Safeguarding Society with Actionable Space Weather Information

Solar Cycle Update

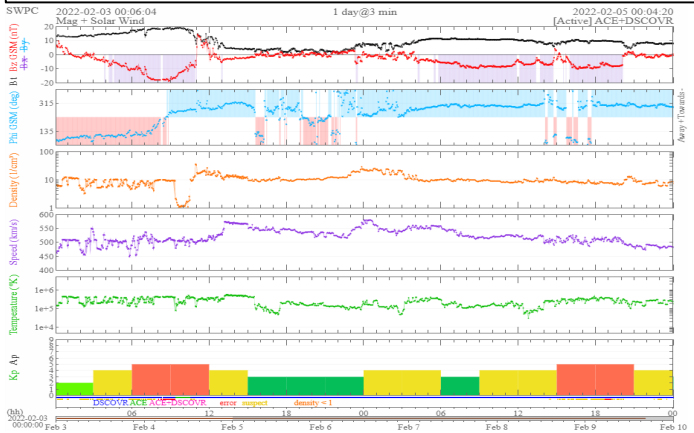
Increasing Activity Past 6 Months



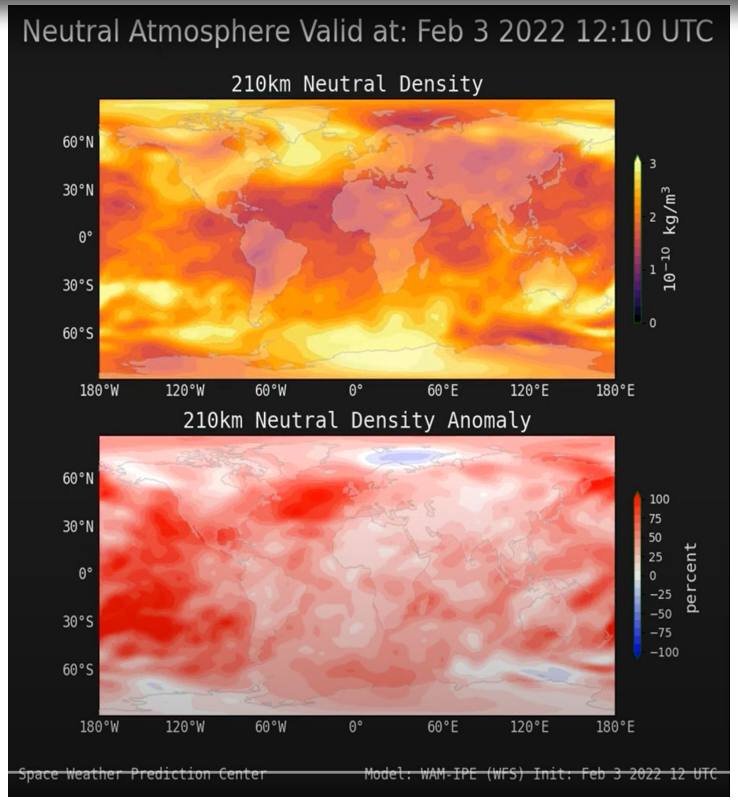
- Second X-flare of the new cycle on October 28, 2021
- Two 100 MeV proton events October 28, 2021 and January 20, 2022
- 22 G1 (Kp=5) or greater geomagnetic storms
- 423 Watches, Warnings, Alerts and Summaries issued
- Prolonged low-level geomagnetic storm in early February linked to loss of 40 Starlink spacecraft
- Solar Cycle 25 progressing more rapidly than consensus forecast

SpaceX Starlink Event

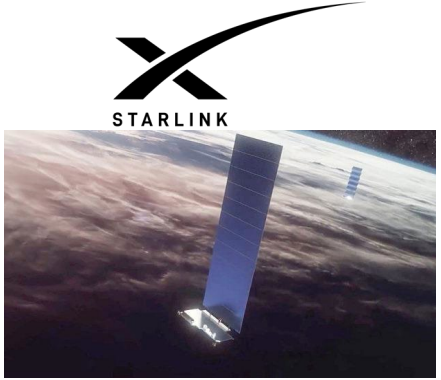
- SpaceX lost 38/49 Starlink satellites launched Feb 3
  - Due to increased drag during orbit raising
    - Sun-synchronous orbit
    - Initial altitude 210 km
    - Orbit raise to 380 km parking orbit
    - On-station 550 km
- Geomagnetic storms (G1) on February 3-4, 2022
  - Watch issued January 31, 2022



Solar Wind Data and Geomagnetic Storm Conditions



Whole Atmosphere Model (WAM)
NOAA/SWPC

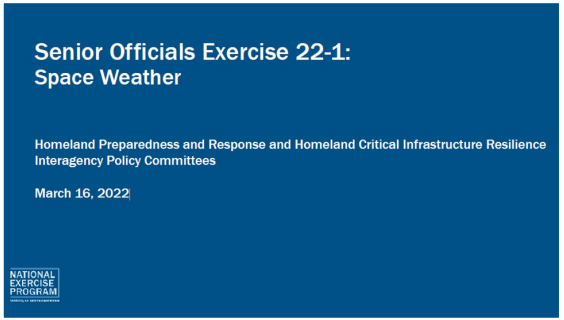


Starlink satellite

Senior Officials Exercise

16 March 2022 – White House

Participants: NSC, Departments of Defense, Energy, Commerce, Transportation, Homeland Security, Interior, NASA, and more



Required by:
- PROSWIFT Act (2020)
- National Defense Authorization Act (2020)
- Executive Order 13744 (2016)

Objectives:

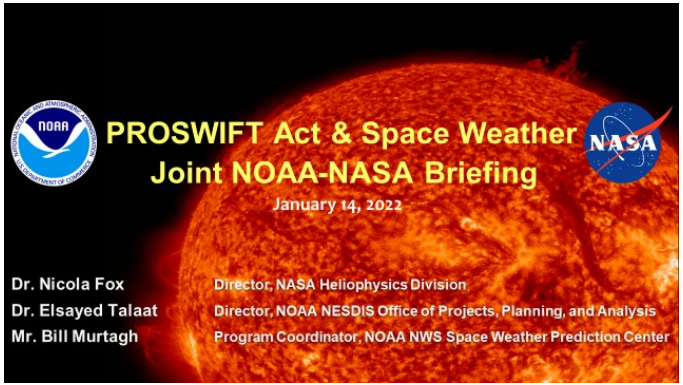
- Review the threat of extreme space weather events and potential impacts to critical infrastructure and Federal department and agency operations

- Identify the preparedness actions that the US Government would take during an Elevated Threat (as identified in the DHS *Federal Operating Concept for Impending Space Weather Events*) to manage impacts of a space weather event (Carrington class)

NOAA-NASA Briefings to Congress

- Nov 2021 & Jan 2022 NASA and NOAA teamed to brief the House Committee on Science, Space, and Technology on implementation of the PROSWIFT Act

- Nicky Fox (NASA), Elsayed Talaat (NESDIS) and Bill Murtagh (NWS)

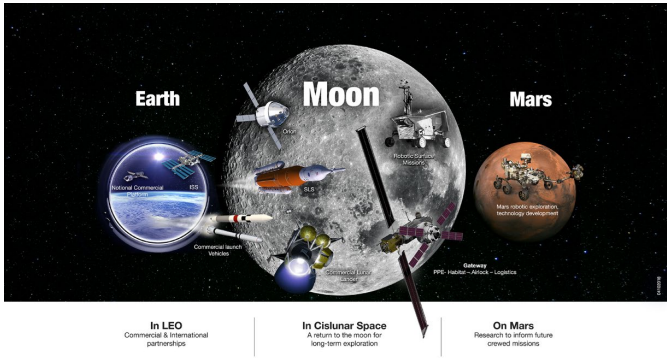


- A key focus of the presentation was the strong partnership between NOAA and NASA and other Federal Agencies in the implementation of the PROSWIFT Act
  - Featured new Space Weather Advisory Group, NAS Roundtable, R2O2R Framework, sustaining and advancing observations, research activities, and data access and information sharing

NOAA SWPC support for NASA Human Spaceflight

Jan 2022: NOAA and NASA sign Interagency Agreement on ***Space Radiation Environment Support to NASA for the Conduct of all Human Spaceflight***.

- SWPC will provide services including observations, briefings, 24-hour forecasts, and warnings and alerts for major space weather events in support of ISS, Artemis Lunar Missions and Lunar Surface Operations, and future Mars missions.
- Signed by NASA/HEOMD and NOAA/NWS AAs
- Continues NOAA's time-honored support for NASA's human space flight activities



NONREIMBURSABLE INTERAGENCY AGREEMENT
BETWEEN
THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

AND UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

FOR SPACE RADIATION ENVIRONMENT SUPPORT TO NASA

ARTICLE 1. AUTHORITY AND PARTIES

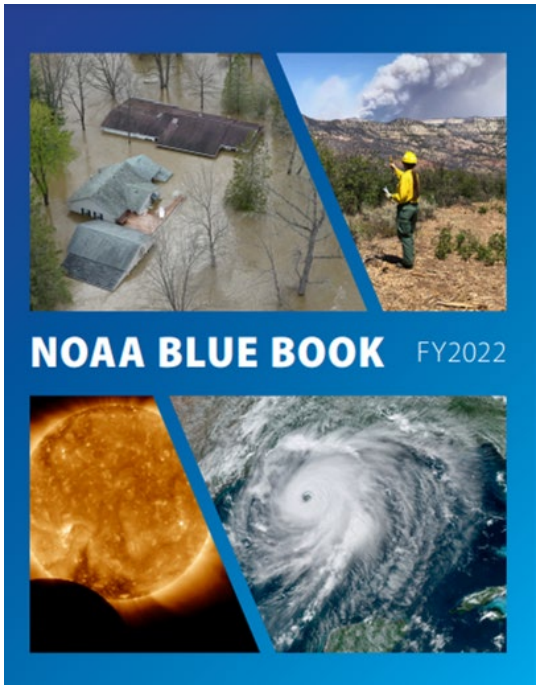
The National Aeronautics and Space Administration, located at 300 E Street SW, Washington, DC 20546 (hereinafter referred to as "NASA") enters into this Interagency Agreement (hereinafter referred to as "IAA") in accordance with 51 U.S.C. § 20113(e). UNITED STATES DEPARTMENT OF COMMERCE, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, located at 325 Broadway, Boulder, CO 80305-3337 (hereinafter referred to as "NOAA Space Weather Prediction Center"), enters into this IAA in accordance with Space Act, Other Transactions Authority (OTA), 51 U.S.C. § 20113(e). NASA and NOAA Space Weather Prediction Center may be individually referred to as a "Party" and collectively referred to as the "Parties." NOAA possesses programmatic authority pursuant to 15 U.S.C. § 1532.

Research-to-Operations-to-Research (R2O2R) Space Weather Prediction Testbed (SWPT)

FY 2022 President's Budget requests $5 million for SWPT

Status:

- Testbed facility construction plans completed
  - Located in Boulder at SWPC
  - If funded, construction begins in 2022
- Late Summer 2022 aviation "experiment"
- Updating federal partners agreements
  - Quad-Agency R2O2R MOU underway

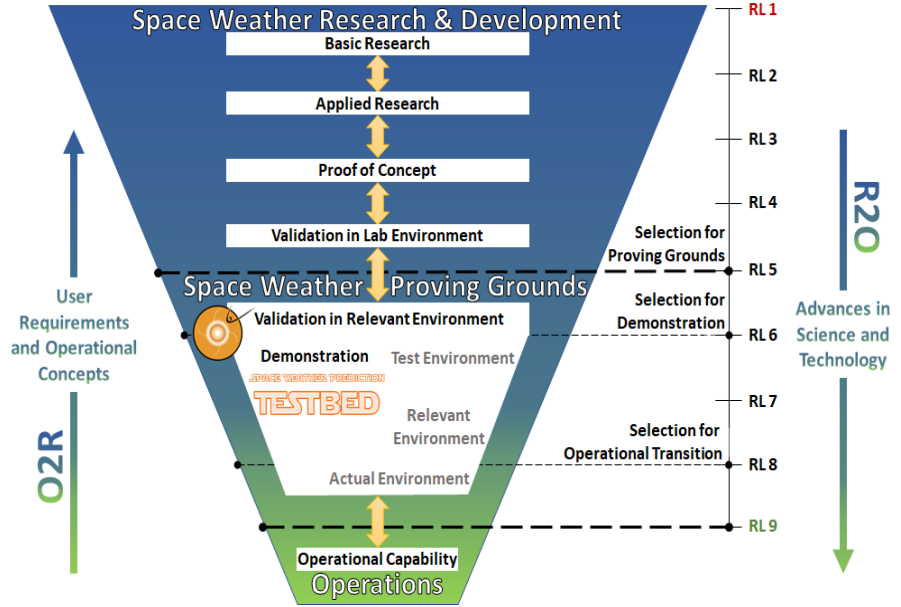


Space Weather Prediction Testbed Aviation Experiment

- **Planned for week 19 Sep 2022 - 3 Days**
  - Boulder, CO
  - Training, Table-top exercises, Requirements
  - Application and modeling demonstrations
- **Key Participants**
  - Researchers
  - Forecasters
  - Industry (airlines, Air Traffic Control, Regulators)
- **Goals**
  - Better understand needs of industry, forecasters, researchers
  - Understand process and key restraints of all participants
  - Identify steps for mission (everyone's) improvement

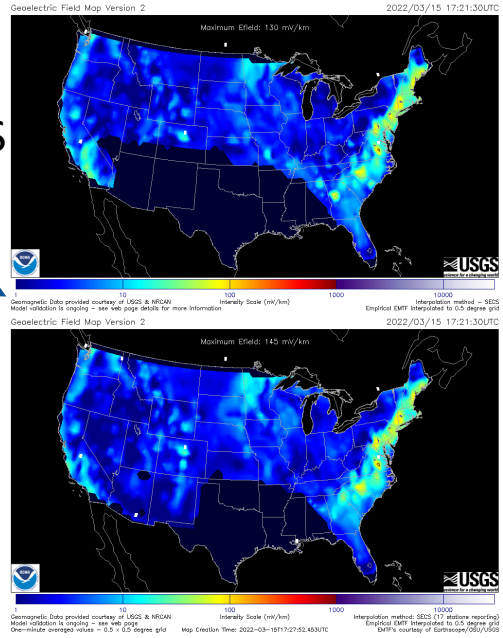
Space Weather Prediction Testbed
R2O2R Process Definition

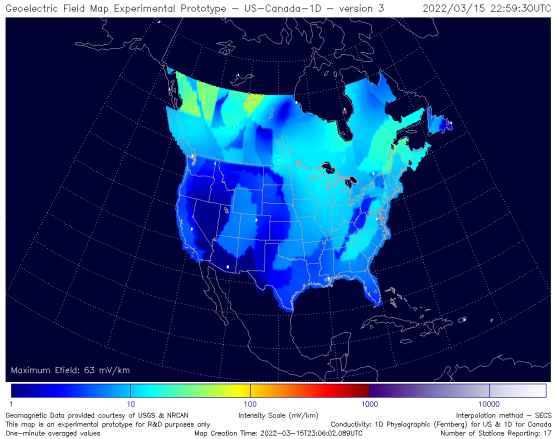
- **Roles & Responsibilities** of Research, Proving Ground, & SWPC R2O2R process
- Describes activities associated with each Readiness Level (RLs)
- Provides checklists activities required to advance from one RL to the next
- Draft being discussed with governmental partners
- Goal is to make public by end of this calendar year



Geospace / Geoelectric
Extension into Canada and MT Survey Expansion

- **SWPC continues its investment in the Joint NOAA/USGS Geoelectric model**
- Key to North American Power Grid resilience
- Two major upgrades in progress
  - TODAY! - Increased coverage of MT survey data for SW US

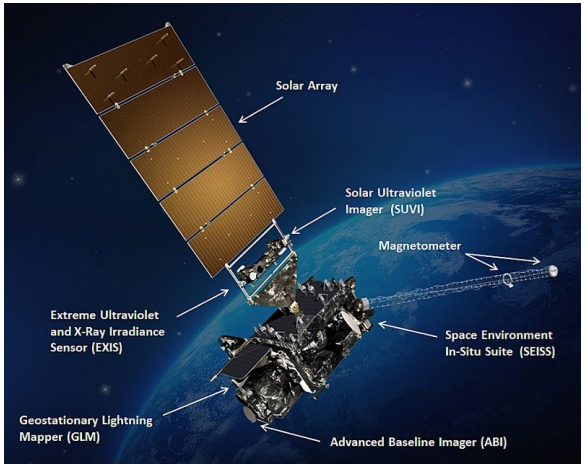




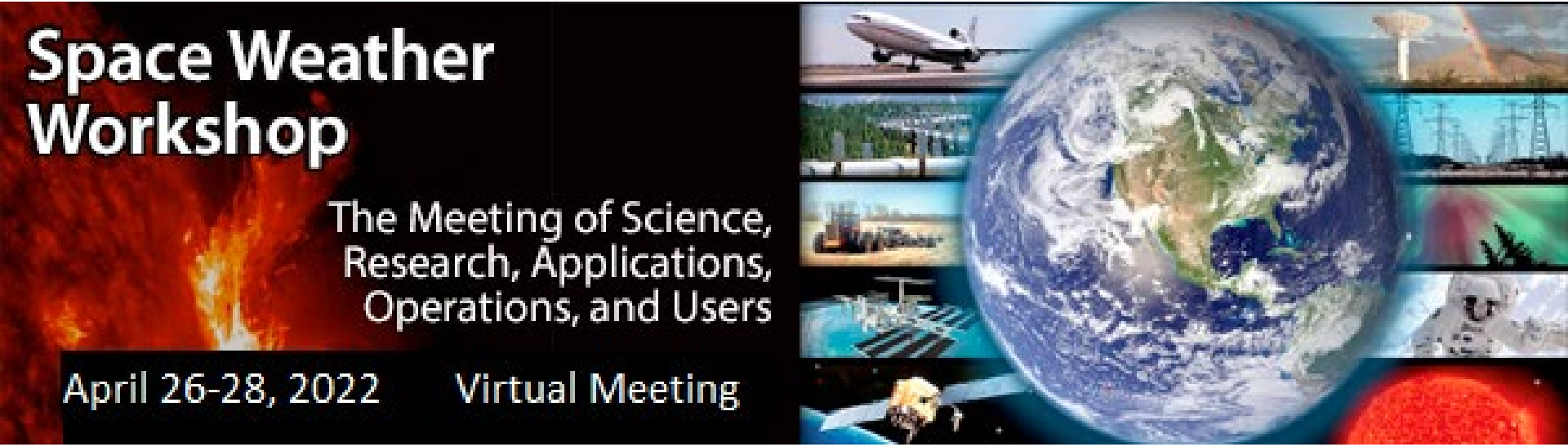
  - Summer 2022 - Expansion into Canada (Experimental)

GOES-18 Products

- **GOES-18 Product Schedule**
- GOES-T launched 01 March 2022
- GOES-18 - On orbit 24 March 2022
- Operational replacement of GOES-17 Jan 2023
- Much work to be done at NESDIS & NWS
- SWx data will not complete validation until Nov 2022
- Anticipating 1-2 months with only one geostationary satellite for space weather data (GOES-16)
- Updates for schedule details will be at SWPC website (spaceweather.gov)



Space Weather Workshop 2022
April 26-28, 2022 (Virtual Meeting)

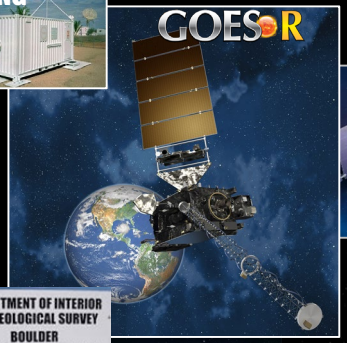


Registration Open Now! - No registration fee

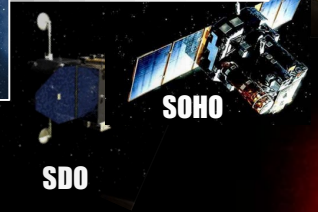
https://www.swpc.noaa.gov/content/annual-meeting

Space Weather-Ready Nation

A Nation Ready, Responsive, and Resilient to Space Weather

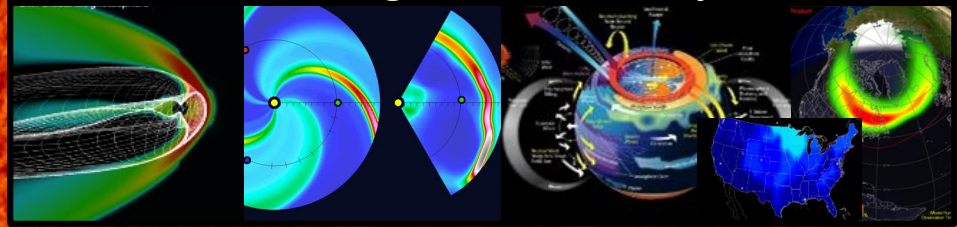


Critical Observations



Improved understanding with new modeling and R2O2R capabilities

SPACE WEATHER PREDICTION TESTBED



Partnerships – the entire Space Weather Enterprise working together

Better information connected to key stakeholders for better decisions - enhance National resilience