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UNBOUND

FOR ENVIRONMENTAL JUSTICE

Prepared by Earth Science Information Partners (ESIP)
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Recommendation Report: Understanding Needs to Broaden Outside Use of NASA Data for the Environmental Justice Community (UNBOUND-EJ)

NASA

ESIP

EARTH SCIENCE INFORMATION PARTNERS

UNBOUND FOR ENVIRONMENTAL JUSTICE

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Environmental Policy Innovation Center - Jessie Mahr, Gabby Mabayyed and Reginald McKinley
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BACKGROUND

What is UNBOUND?

NASA's Understanding Needs to Broaden the Outside Use of NASA Data (UNBOUND) program works to engage and understand the needs of nontraditional potential users of NASA data. Through a series of workshops, participating organizations from various communities and disciplines learn about a range of NASA products and services. Participants provided both general feedback and insights on specific tools to inform decision making and prioritization to ultimately make NASA products more usable by new audiences.

UNBOUND-EJ Workshops

Workshop One
April 29, 12-5 p.m. EDT

Workshop Two
May 18, 12-3 p.m. EDT

Workshop Three
June 8, 12-3 p.m. EDT

Workshop Four
June 21, 12 - 1:30 p.m. EDT

Participant Selection

Established relationships with individuals in environmental justice (EJ) networks is key to engaging communities facing EJ issues like exposure extreme heat, inequitable environmental health conditions, and disproportionate impacts from natural disasters.

ESIP is a community of Earth science data professionals. While some ESIP community members directly engage in EJ work, this is not ESIP's primary network. ESIP engaged a subject matter expert and workshop lead, Regan Patterson to increase ESIP capacity and create more established connections for participant recruitment. We received applications from 64 entities, selected 15, and 13 agreed to participate. Specific EJ areas of interest among selected participants included: extreme heat events, coastal resilience, extreme precipitation events and related pollution incidents, and general economic and environmental concerns.

Participant organizations received a stipend of $2,500 for their participation. Participants were screened for their experience level working with data as we were looking to identify data practitioners who either had not used NASA data or who were not currently using NASA data. Participant selection also sought to achieve diversity among the participants including geographic and sector diversity amongst selected organizations. To enable a teamwork dynamic, selected organizations were permitted to have more than one affiliated individual attend, although each organization only received one stipend.

The workshop series was initially designed to be a series of three virtual workshops several hours in length with two-week working sessions in between. The design was to equip the participants with tools, networks, and a dedicated Slack channel to support their needs during and after the workshops.

WORKSHOP SERIES

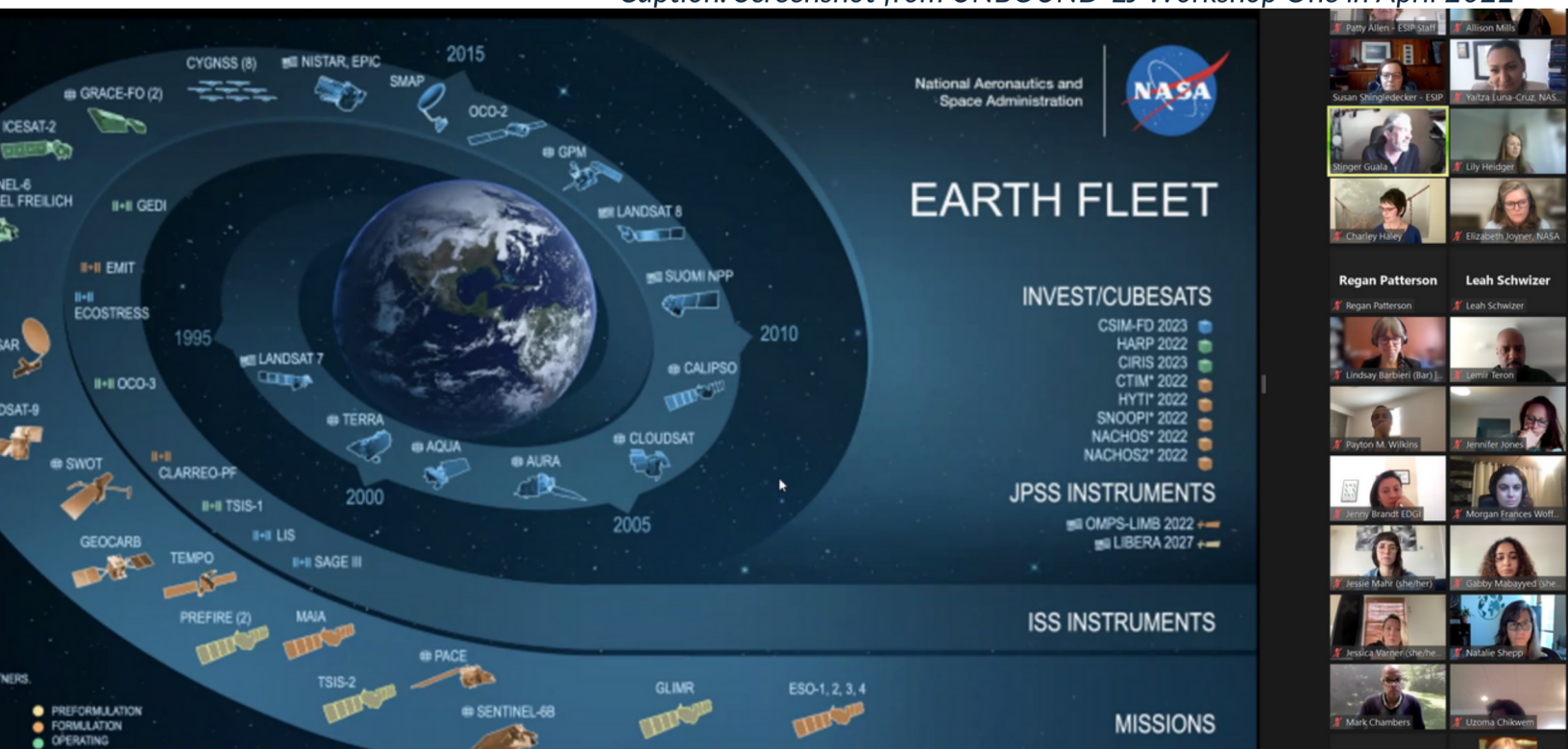
Workshop One - April 29, 2022
Participant introductions, overview of the UNBOUND program and using NASA data for EJ work, demo of tutorials for data discovery, and an intro to tools and support for getting help during exploration between workshops.

Workshop Two - May 18, 2022
Share participant experiences accessing and working with NASA data, provide additional focused tutorials based on the feedback received after workshop one, and provide input to participants on how to provide structured feedback.

Workshop Three - June 8, 2022
Listening sessions and generating insights.

Workshop Four - June 21, 2022
After Workshop One, ESIP received limited feedback during the two-week working session. This made it necessary to add an additional feedback session to solicit structured feedback from participants to determine additional resources and tutorials.

Caption: Screenshot from UNBOUND-EJ Workshop One in April 2022



CREATING COMMUNITY

At the start of Workshop One we had each presenter and participant create a slide with a photo their individual and organizational names, and answers to three questions. During introductions, the interaction and the side conversations in the chat made it clear that there were existing connections in the group.

ESIP created a dedicated Slack space and provided a tutorial on how to use Slack for participants to post and ask for help during the course of the workshop series. We had hoped that the Slack space would provide a place between workshops where participants could ask questions and seek help if they became stuck. While this has been an effective technique in other settings, it was not used much by this group of participants.

We did include both NASA experts and participants in the Slack channel. We heard from some participants that they were intimidated when there were too many experts in the workshops.

Tutorials offered

The workshop series offered a mix of use cases, tutorials, hands-on demos, and work time between sessions. The full list of videos is available on ESIP's YouTube channel: esipfed.org/unbound-ej-videos

Use Cases:
Dr. David Padgett, Tennessee State University
"The Global Learning and Observations to Benefit the Environment (GLOBE) Historically Black College and University (HBCU) Informal Education Institution (IEI) Collaborative: A Construct for Closing the Racial Achievement Gap in Science, Technology, Engineering and Math (STEM) Disciplines"

Dr. Carolyn Hultquist and Colleen Neely, Center for International Earth Science Information Network (CIESEN), Columbia Climate School
"Developing a tool to identify flood-vulnerable communities"

James Cottone, New York City Council Land Use Division
"Visualizing the Urban Heat Island in New York City"

Demos:
NASA Earth Data and Data Pathfinders - Elizabeth Joyner
NASA Worldview - Leah Schwizer
Disaster Portal - Rachel Soobitsky
Extreme Heat - Elizabeth Joyner
Sea Level Rise - Greg Yetman
Socioeconomic - Dr. Alex de Sherbinin

FINDINGS

Workshop Implementation

Assembling a group of stakeholders who are experienced data professionals, but not currently using NASA data, proved to be challenging.

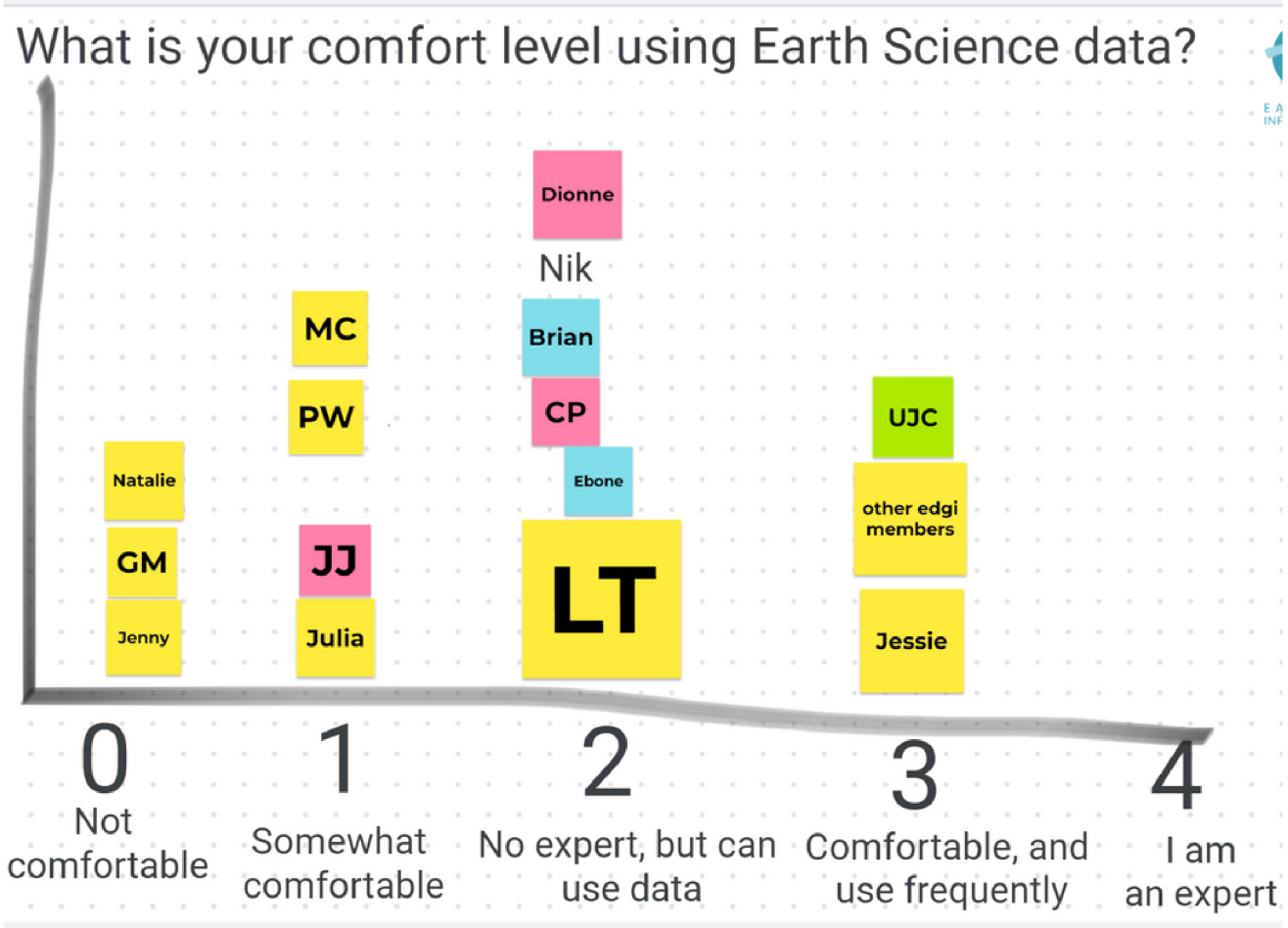
In our initial screening questionnaire, we had 64 responses. Of that, 53% of interested applicants had not used NASA data, 14% were currently using NASA data, 22% had used NASA data in the past, 11% were unsure if they had used NASA data. It was challenging to determine an applicant's base data knowledge and comfort level.

Caption: Jamboard from Workshop One

Specific to EJ Stakeholders

Participants expressed a desire to not only be able to work directly with the data products themselves but also to share them with decision makers and others in the communities they serve.

Inclusion and accessibility are core tenets within the EJ data community. This requires either a more advanced grasp of the tools to be able to show others or requires more simplified views for sharing with others who are not as familiar or comfortable working directly with data.



We sought to select participants who indicated they are comfortable working with data but the types of datasets used by the applicants varied greatly, including: EPA resources like EJ Screen, census data, Landsat, and county-level health data from the CDC. Selected participants represented a wide range of organizations from large national groups to small grassroots organizations.

We had professors and students from HBCUs and staff from local government agencies. Individual's aptitude also ranged from those who are regularly working with remotely sensed data and are looking to move into 3D modeling and AR/VR, to those who are limited in their ability to access mainstream GIS packages. As a result, the recommendations vary widely as the user types, and their needs and expectations, range significantly.

Caption: Part of the UNBOUND organizing team presents at the 2022 July ESIP Meeting.

NASA RECOMMENDATIONS

Most participants struggled with knowing where to start.

While there are a number of entry points, a decision tree or other selection or search tool would be helpful for beginners. Participants appreciated the EJ Backgrounder, but found it text heavy and lacking in clickable areas to continue exploration by topical area. Once inside tools like Earth Data Search or Worldview, many participants needed more help with search and navigation, especially in understanding the differences between various data layers and help in selecting the most appropriate datasets.

The following is specific feedback on different NASA tools.

Earth Data

- New user account setup - clarify the user types when creating a new account. Consider adding “public user” or “application”
- Provide more descriptions to help users select data layers. Some users were looking for more technical explanations while others were looking for more clear guidance on which datasets are best to use for different parameters and why.
- One user is particularly interested in 3D modeling and game technology asked for Downloadable ArcGIS or universal geospatial files like gltf to easily visualize it as a 3D globe.

Disaster Mapping Portal

- Improve and update the disaster dashboard
  - “the disaster dashboard either wouldn't load and when it did the visuals seemed off/I don't think the layers were working very well”
- Add layer descriptions
  - “provide a detail, reference, or explanation of each layer within the dashboard”

Extreme Heat Pathfinder

- Include list of variables
  - “It could be useful to have a comprehensive list of natural variables that influence extreme heat, such as soil moisture, infrastructure, air quality, etc. While these options do not need to be large selectable boxes on the webpage, it could be helpful to have an 'other variables' selection that takes you to an article of useful extreme heat variables to map”

Worldview

- Have a step before Worldview that provides an entry point with fewer options
- Have the Introduction to Worldview as a default; do not require selection on first pop-up
- Have an easily seen description on each layer that includes temporal frequency
    - “more technical explanation incorporated with the layers”
    - “more insight on which layers to use / datasets to explore”
    - “It could be helpful to have a data organizational tab that separates data by spatial dimensions”
    - “Better categorization or filters added to the search algorithm especially on how to utilize the data”
- Improve the legend
- Have a step-by-step tutorial
- Add simpler filters and more basic keywords
- Have previews show links to other articles and how the data are being used
- Include links to socioeconomic data
- Add tree canopy data
- Need more descriptions on soil moisture variables
    - “I found the descriptions for the different soil moisture variables hard to distinguish between when looking to add soil moisture layers in Worldview. After reading each of the descriptions, I researched what the difference is between ‘normalized polarization difference’ and ‘single channel algorithm’”
- Data refresh
    - “provide a ‘data loading’ indicator for larger layers that may not necessarily appear right away”
- Improve data visualization
    - “Additionally, it would also be helpful if 1) you could name or tile the screenshot of the map before downloading it, and 2) include a legend in the screenshot of the map. In addition, I am not well-versed in how pixelation impacts picture resolution, so it could be helpful if an information note icon was available to explain how to choose the right pixel resolution. For some of the maps, it was hard to locate state borders in the screenshots. Is there a recommended basemap to be used to avoid overpowering the overlaid layers? I tried changing the opacity, but it was not too helpful”
    - “soil moisture data was super pixelated and difficult to read when zooming in to a certain area”
    - “making the data a little more clear in terms of qualitative and quantitative - my goal is to understand so I can teach others and it's hard for me to teach others when I don't really know how to read the data”
- Improve cloud filters
    - Difficult to find cloud filters
    - Unsure if gaps in images were a sensor failure or product of the shape of earth
- Implement into a (VR) software or app (e.g., Fortnite, Cesium) for teaching about environmental justice

SEDAC Tools

- Make it more interactive
  - For SEDAC Low-Elevation Coastal Zone specifically, have a “simple interactive map accessible for initial data exploration before having to download files”
- SEDAC Hazards Mapper app integration
  - “It would be great if flooding data (maybe dam malfunctions or something and flood zone data in areas around a selected dam, etc.) could be added to the Hazards and Population Manager app”

Global Imagery Browse Services (GIBS) Application

- Make location searchable by specific coordinates
  - “When using the GIBS application, I found it challenging to find the location I am focusing on. It would be helpful if I could search specific coordinates within this interface, or if specific timestamps were searchable”

Open Source GIS

- Some NASA data uses ArcGIS, which is a barrier for organizations who do not have access or cannot afford (note: most NASA data is not in proprietary formats)
- Many participants indicated that they use various open source GIS packages and could use some demos of working with NASA data in an open source GIS package
- Other participants would like to learn more about open source GIS

Caption: Subject matter expert Regan Patterson and facilitator Charley Haley introduce UNBOUND

EMERGING THEMES

EJ-Specific Pathfinder/Toolkit

- Indicate which pathfinders and toolkits have EJ components on the NASA portal
- On specific pathfinders, EJ content is at the bottom of the page; could be reformatted in the layout/bring the content higher or provide buttons up high that link to the section

EJ-Specific Data Tool

- Create an EJ tool online where you can go in and see the factors that affect EJ communities similar to the White House tool
  - Is there a way to add NASA data to EJScreen?
  - Integrate NASA data with EJ/Justice40 datasets
- This tool should include a popup feature that suggests other data layers that would address issues of concern for particular location

Help Users Find the Right Tool

- For pathfinders, lay out the difference between the datasets and how they have previously been used: "Explain the difference between each tool so that users can identify which one most accurately meets their needs"
- Need a series of questions that help people get to the right tool
  - Narrow down and determine details on the data and how to use it properly
  - Often difficult to figure out what is the best thing to use
- Potentially have a table of contents or landing pages with potential uses and resources (e.g., 'if you want to do this, go here')
  - Offer academic and layperson routes
  - Decision tree or data pathfinder; search bar
  - Provide tool explanations with the differences and applications for certain use cases
- Need a well-organized place to start

Incorporate Community Data/Knowledge

- Create an interface that brings together NASA and community data
  - Incorporation of different kinds of knowledge. Looking at knowledge that people bring to the table and treating everything equally. Technical and storytelling skills are both valued and nothing is more important

Transferability and Translatability

- Stakeholders want to connect their communities directly to the data
- Not science for the sake of science but for advocacy (basic science vs. application)

Internet (In)accessibility

- In terms of a lack of internet accessibility, how do we teach communities how to use NASA data when there is a lack of internet?

ENVISIONING DATA TOOLS

Key Features of Tools Currently Used

- Like how simplistic and user friendly EJScreen and the National Environmental Public Health Tracking Tool are. They are ideal examples of mapping tools that could be used for policy change
- Visualization tools are especially important for policy change
- Survey feedback:
  - “EJ SCREEN: user friendly”
  - “Simple interface” (describing EPA’s TRI)
  - “it's layering capabilities; easy use; looking at the data at different levels (state, regional, national); there is a clear purpose of how they should be used and when” (describing EPA EJScreen, QGIS, CEJST, state specific screening tools)
  - “The mapview feature” (describing EPA EJScreen)
  - “Being able to compare census data”
  - “The download capability of the tools. In the advocacy realm, a lot of the data use comes from doing extra analysis -- not simply reviewing information within the tool as it is presented online. Having the ability to download information (e.g., details, coordinates, frequencies, etc.) is what makes some of the go-to resources, many of which are NOAA datasets”

Ideal Data Tools

- Should not ask the end-user to process the data
- Add data search by zip code, region
- Include temporal frequency and date range
- Crosswalk the potential applications for a certain type of data
- Add filters
- Customizable legend
  - Tools should allow users to customize a legend so that if you download an image, you know what colors stood for
  - Enable ability to change the colors to accommodate accessibility issues (e.g., color blindness)
- Make data accessible during disasters
- Downloadable into existing mobile apps that can be available offline and has the capacity for public input
- Pair EPA EJScreen’s user friendliness with NASA tools’ capabilities
  - Include features that allow you to easily manipulate data and download images that can be shown to communities

POTENTIAL ENGAGEMENT

Organizations

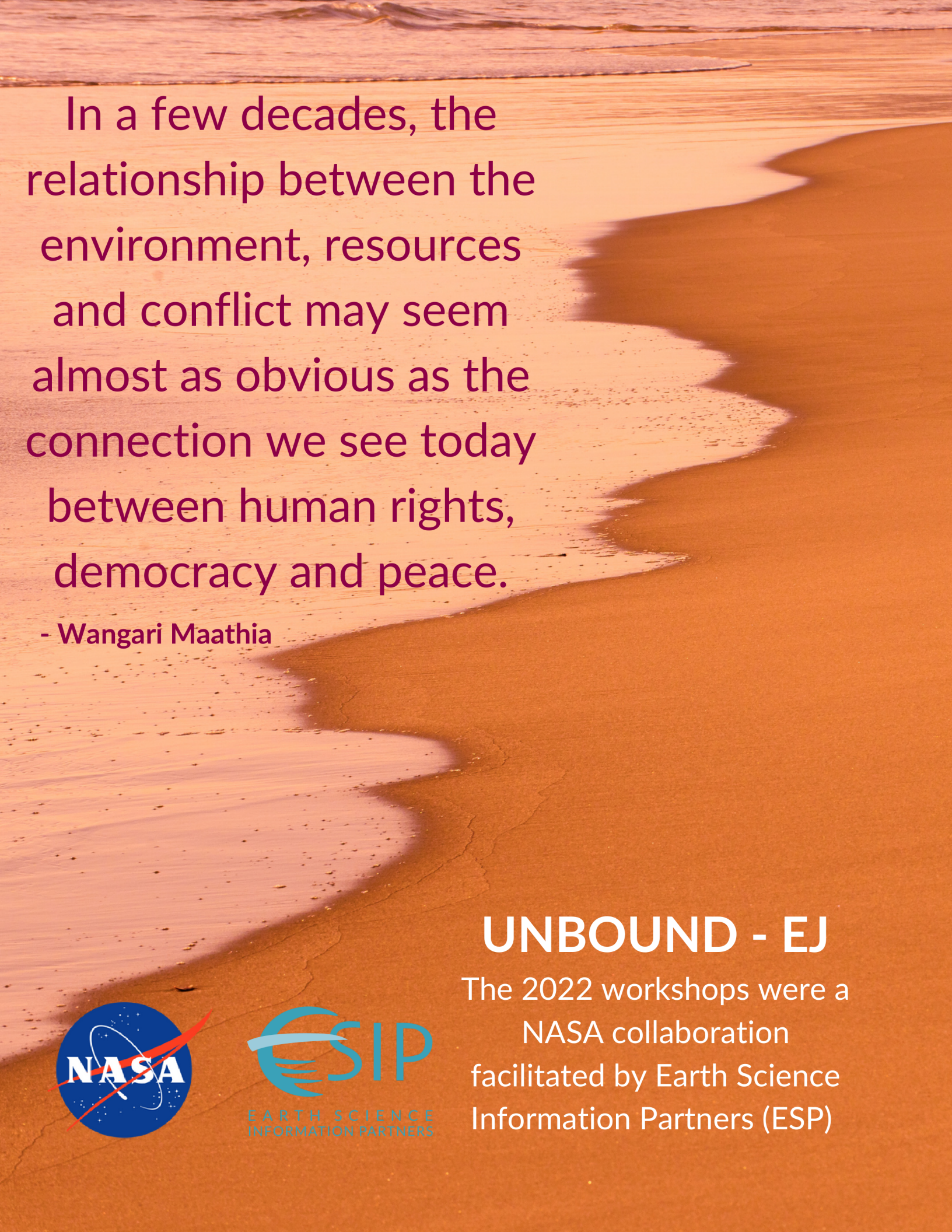
To further engage the Environmental Justice Community participants recommended building connections with the following groups:

- Environmental (justice) law communities
- EPA EJ listserv
- Anthropocene Alliance
- USDS CEJST Community Group
- EPN
- Climate Exchange Network
- HBCU Climate Change Consortium
- CIDA in Port Arthur Texas
- State and local floodplain managers
- Chief resilience officers (State Resilience Partnership)
- Community engagement and economic development officials
- CSA farmers
- AMS BRAID Committee
- National Black Environmental Justice Network
- Deep South Center for Environmental Justice

Groups/Meetings/Conferences

The following is a list of meetings and conferences to further NASA's outreach and engagement with environmental justice organizations

- Urban Affairs Association
- International Society Urban Health
- National Environmental Justice Conference
- National Environmental Justice Advisory Council (NEJAC)
- White House Environmental Justice Advisory Council (WHEJAC)
- UN Conference of Parties
- NOAA Equity in Action Symposium
- Climate Adaptation Science Centers (CASCs)
- Southern Climate Impacts Planning Program
- HBCU Climate Change Conference



In a few decades, the relationship between the environment, resources and conflict may seem almost as obvious as the connection we see today between human rights, democracy and peace.

- Wangari Maathia

UNBOUND - EJ

The 2022 workshops were a NASA collaboration facilitated by Earth Science Information Partners (ESP)

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