

NASA Applied Sciences Advisory Committee

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NASA HQ and Teleconference

MEETING MINUTES

David Saah, Chair

Christine McMahon-Bognar, Executive Secretary

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Thursday, February 22, 2024

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*Prepared by Jeanette Edelstein
Tom & Jerry, Inc.*

Opening Remarks

Ms. Christine McMahon-Bognar opened the meeting and reminded everyone that the Applied Sciences Advisory Committee (ASAC) is under federal charter and advises the NASA Earth Sciences Division. Dr. David Saah added a few logistical notes.

The meeting participants introduced themselves.

- **Mr. Albert Anoubon Momo**, from the consulting firm GeoDEV International is also the co-chair of International Advisory Committee of the United Nations Global Geodetic Centre of Excellence and the chair of the Cadasta Foundation. He worked for the United States Agency for International Development (USAID), managing the SERVIR project for 6 years and currently Vice President and Executive Director for Emerging Markets and Funded Projects at Trimble.
- **Dr. Ed Kearns** is the Chief Science Officer at First Street working on climate services and climate risk at asset-specific levels. Prior to his current role, he was a chief data officer at the National Oceanic and Atmospheric Administration (NOAA) and the Department of Commerce, the program examiner at NASA Science, and a professor at the University of Miami working on the Moderate Resolution Imaging Spectroradiometer (MODIS).
- **Ms. Rhiannan Price** is with DEV Global, a consulting firm for geospatial remote sensing for assisting sustainable development for humanitarian applications working with groups such as the United Nations, Gates Foundation. Prior to consulting, she led the sustainable development program at Maxar where she saw the potential of what could be done that might not happen in private sector.
- **Dr. Lisa Dilling** joined ASAC while she was still a professor at the University of Colorado, Boulder. She has studied the intersection of science and society and how to make science more usable for decision making, such as carbon science/carbon management, adaptation, water management in cities. She has worked at NOAA in the Office of Global Programs and, last year, left professorship to join the science branch as the Associate Chief Scientist at the Environmental Defense Fund (EDF) to be closer to the impact side.
- **Dr. Dave Wilkie** is the Executive Director at the Wildlife Conservation Society (WCS) and has mostly been working with indigenous people around the world for the last 20 years. He started the conservation initiative on human rights and the Rights + Communities program at WCS. His background includes early use of the only NASA satellite up at that time: the Multispectral Scanner (MSS) and experience gained using it in the Congo. He also authored a book that was an introduction to remote sensing for a conservation scientists.
- **Dr. David Saah** is a professor at University of San Francisco (USF) and has an environmental think tank connected to the university. He works in the boundary between public, private, and nonprofit and is focused on work with SERVIR and the World Bank. Domestically, he works on fire, carbon, ecosystems services, and more with the United States Forest Service (USFS) and a variety of state agencies. He is interested in how to go from applied research to on the ground impact and believes the secret to success in this area has been creating real partnerships.

- **Mr. Ian Schuler** is with Development Seed and is, broadly, interested in making earth data more useful, applicable, and actionable for the good of the planet. Development Seed works with non-governmental organizations (NGOs) and government agencies (including various parts of NASA).
- **Dr. Nancy Searby**, NASA Headquarters (HQ), is the program manager for the Earth Science Applied Sciences Capacity Building Program. She manages SERVIR, DEVELOP, and Applied Remote Sensing Training (ARSET), and the indigenous peoples initiative. She had Equity and Environmental Justice, as well, until recently when it was taken over by Michelle Hawkins.
- **Dr. Emily Sylak-Glassman**, NASA HQ, is the Deputy Associate for Earth Action.
- **Ms. Amanda Moore**, NASA HQ, works as the operations officer for the Earth Action team.
- **Ms. Christine McMahon-Bognar**, NASA HQ, is the designated federal officer and executive secretary for the committee.

Dr. Saah mentioned that it has been a while since the committee has met and asked everyone to bring their personal experiences and candor into the conversation. He encouraged people to add notes to the shared document.

Intent for ASAC Engagement from Earth Action

Tom Wagner introduced himself and reviewed his background, which includes a bachelor's in geology, 6 years in a chemistry lab, and about 6 years teaching at the University of Papua New Guinea. He did work on the Human Development Report with the United Nations Development Programme (UNDP), worked on a biodiversity project with World Bank, and worked in environmental activism. From 2002 to 2009, he was with the National Science Foundation (NSF), starting in earth sciences and finishing in polar. Wagner came to NASA in 2009 to run the cryogenics program where he did polar work; worked on High Mountain Asia; and ran the Earth Ventures program, selecting the Earth Surface Mineral Dust Source Investigation (EMIT) mission, CubeSat missions, and larger missions. He was the program scientist for Ice, Cloud, and Land Elevation Satellite-2 (ICESat-2) and Light Detection and Ranging (LIDAR). Then, he ran the Discovery Program in Planetary Sciences for 5 years, picking missions to go to Venus and working on the Dragonfly mission. Climate change kept calling, so Wagner moved to his current position and is excited to be solutions-oriented. He has awarded projects from \$2500 to support a single student finishing a master's degree to multi-billion dollar missions.

Dr. Wagner has learned that the system in Washington, D.C. relies on the willingness of the community to pitch new ideas. He said that, although 75% of his formal interaction with principal investigators (PIs) is giving bad news (including budget cuts), talking to PIs and hearing their ideas is the best part of his job. In his current role, Dr. Wagner is at his second agency and fifth division and has learned many lessons about communities, solicitations that meet their needs, and the importance of the infusion of climate change into all conversations at NASA.

Then, Dr. Wagner talked about the importance of the values of transparency and community and the mesh model are to the success of this team. He said ASAC is made of leaders in the

community that can inform other leaders and encourage the community to come together for resources and to build a framework for career development.

Turning to what is needed from ASAC, Dr. Wagner reviewed the committee charge and asked for “gentle course corrections,” on salient topics that may not be covered currently. He asked that the committee raise community-wide issues, including information about people entering the field and areas of study (e.g., sea ice) that are not seeing an infusion of new people. Also, the committee might address the fact that some partners may feel overprescribed.

Dr. Wagner also reviewed other key topics that are important but would not be part of this meeting: reprioritizing new versus continuing activities; maintaining solutions that don’t make it to Application Readiness Level 9 (ARL9); and addressing depth and breadth, focusing on key problems versus a wide range of issues.

Dr. Wagner said that the planned outcomes from *this* meeting were that the committee 1) learned about the program, 2) offered comments and recommendations on scaling, and 3) discussed topics and the approach for the next meeting. He expressed appreciation for the members’ time.

Dr. Saah introduced the discussion by reminding everyone that the intent was to create recommendations that are both useful and actionable.

Discussion

Dr. Lisa Dilling said that scaling is the challenge everywhere she goes. Dr. David Wilkie agreed, and added that there is an unfortunate perception on the part of donors that scaling just means replicating small, successful projects in other places and a belief that projects get cheaper as you scale. Conversely, there are no economies of scale in scaling, in many cases, and that must be considered in scaling equations: that scaling will cost you the same per unit, whether one or one thousand units.

Mr. Albert Anoubon Momo said there is always a challenge to scaling and that people often think scaling means taking what they are doing here and doing it somewhere else. Scaling sometimes means taking a different approach and an open mind is required for scaling.

Dr. Saah said that there is typically a natural progress to, for example, a conservation project. He said that the complexity and charge to innovate and grow various elements at particular paces begs the question of how to build an environment where you can get small projects seeded, midsized projects graduated, and larger projects scaled, especially in a resource-constrained environment. It was suggested that money doesn’t always fix things; constraints can help and even force efficiencies, and mechanisms need to be set for that proactively.

Dr. Kearns said that the one thing that scales well in live sciences is data. There is an ongoing struggle for everyone to get access to NASA data in a timely fashion and scaling can slow down an already slow process. He said there needs to be a balance and consideration for the project

(e.g., a paper, an application) and the need to get the data to the wider community to achieve scale. Dr. Saah clarified that the data being discussed was for Applied Sciences. Dr. Kearns continued that shining a light and getting as many different groups plugged into the data sources as fast as possible is critical to maximize scale and impact.

Mr. Ian Schuler said that scaling across projects comes after doing the project multiple times and looking for the nub that would make the project easier for the next users. He asked about the transition out of NASA: where are the next users -- industry, academics, other parts of NASA?

Dr. Wagner referred to the afternoon's conversation about scaling, but said Applied Sciences takes all comers. He gave a couple examples from all the projects that have gone from research to operations, about 40: people talking to local leaders (e.g., the sea level change team) and then working with the Federal Emergency Management Agency (FEMA) other federal agencies that do flooding and John Haynes' program, the Health & Air Quality Applied Sciences Team (HAQAST), working at state levels on air quality levels.

Dr. Nancy Searby said that, within the context of SERVIR, the discussion is around services because SERVIR tries to work with national stakeholders to offer a service to enable their service provision and then uses a regional hub and a Science Coordination Office (SCO) for a tiered backup. DEVELOP is a domestically focused program, with 10-week projects working with users and local partners, and those projects are everywhere. She thinks that prioritization is an important part of scaling discussions, particularly priorities from a vulnerability perspective, for humans and nature.

Dr. John Haynes, joining via Webex, discussed HAQAST, which created a community that had the ability to scale new ideas. Every 6 months the community meets (about 50% researchers/50% stakeholders and end users) to exchange information about accomplishments and gather new needs and challenges, so HAQAST can work with them to come up with solutions. Solutions are implemented in an 18-month tiger team cycle. The greater HAQAST community then provides a mechanism to scale those solutions. Dr. Haynes noted that the current iteration of HAQAST will conclude in early 2025 but there is a new solicitation to re-compete for a new HAQAST launch to run through 2029. He said there were lessons learned from 2011 that took a few iterations to discover: the sweet spot of tenure (5 years was too long, 3 years was too short, about a 4 year tenure is probably best); the sweet spot of number of members (too large herding cats, too small not the right balance of expertise, 14 or the range of 12-15 seems right); how to run tiger teams (ideas are sorted by members, expertise is determined, and 2-pagers are taken to community review by impartial stakeholders).

Dr. Haynes said that they ensured the enrollment of people along the entire career spectrum through particular focus in the last round of 2020 member selection, in solicitation language (i.e., that there be a broad range of expertise but also among career paths) and encouragement of people of all levels to apply (members can have co-investigators, graduate students, and collaborators as part of the application group). So, there are 14 members, 70 co-Is, a huge

cadre of graduate students, and 300+ stakeholders and end users that attend meetings. They also depend on peer reviewers for proposals for HAQAST membership.

Dr. Haynes agreed that HAQAST is harder to manage than a traditional Research Opportunities in Space and Earth Science (ROSES) proposal: it takes a lot of time and effort to manage and needs an awesome team lead (HAQAST has had Tracy Holloway at the University of Wisconsin, for last the 10 years and she has a coordinator/graduate student to help). Even with a strong leadership team, coordination of meetings, tiger teams, and organizing sessions at conferences, he said it's a big effort but it pays off.

Mr. Schuler said it seems like a lot of the implementers are academics and graduate students at traditional research institutions and end users seem to be in more operational roles in government and state agencies. He wondered how crossing the chasm between pure R&D/academic institution to the operational needs of a group like a state health agency is managed. Dr. Haynes replied that it is through the peer review process at the beginning. Peer review has to be in the proposal, along with why they'd like to be a member, their expertise with team and application environments, and a core project for themselves and an end user stakeholder. There are core projects over 4 years and, every 6 months, there is discussion about the many projects they can tackle as a group. It's core work plus teamwork. The growing pains of the initial makeup of HAQAST as mostly R&D people were valuable because more people became interested in applied work, which can lead to just as many peer reviewed publications and with more collaborators. Now there are far more proposals (70+) in the last round; the academic community has grown in the environmental health and air quality area over the last decade.

Dr. Wilkie asked, in terms of scaling, what's the barrier to scale to 300 then 3,000 end users? Dr. Haynes said more money is needed and stressed the value of Tracy Holloway's work, but said the biggest barrier is building capacity; they have worked with Dr. Searby and ARSET for the wider environmental health and air quality community. He said NASA has all this data and modeling capability and needs to determine how to use it. He said the train-the-trainer model is necessary. In 2023, in HAQAST, an ambassador program was launched for super users. They were charged as HAQAST ambassadors to spread the word and help train new people to use NASA earth observations. Dr. Kearns noted that operations people may be discouraged from applying because they would not write a proposal with scaling in mind.

Dr. Doorn, joining via Webex, with a diversity of experience supporting PIs and using a consortium model for agriculture, spoke to scaling, which his consortia are specifically tasked to address. They have found that scaling brings on new research and new challenges. With OpenET this expands the universe of research, which is one way to draw in the academic community. Dr. Wagner briefed the Ukraine work at the ESAC meeting and said that is now being scaled at country levels. There are differences: crops, issues, needs, requirements in different countries and a need to determine how to loop those issues into the system (i.e., for use in Kenya versus Kansas). Feeding those challenges back to NASA will flood the zone of

research topics. This entails a lot of capacity building and workforce development activities and the new domestic program has a specific task to do workforce develop for domestic agriculture.

Mr. Schuler brought up the difference between horizontal scaling and vertical scaling: horizontal scaling taking the same project to different places; vertical scaling implementing one idea in a different way for many people/places. He said it sounds like NASA is doing all horizontal scaling and asked whether NASA is interested in increasing horizontal scaling or in doing vertical scaling. *Dr. Turner replied “both” via chat.*

Dr. Doorn said he believes it’s vertical, (e.g., taking irrigation management in Idaho to a global scale) how do you take one model and create multiple models, institutionally, for global application to empower local activities. Mr. Anoubon Momo said that scaling horizontally is basically application. Vertical scaling is what is actually considered scaling. In the private sector, the saying goes “what got you here, won’t get you there.” If you want to scale vertically, he said, it’s not having more people or larger offices, you have to learn from what you were doing and ask, what should I change in order to get to scale? It is a different way of thinking.

Dr. Woody Turner, joining via Webex, agreed with Dr. Doorn that most attempts to scale at NASA are at the horizontal level, which is hard because it takes people, money, and things in short supply; but, he said that vertical scaling is the goal because, for example, you can’t just take the same drought approach from U.S. fields to Africa. That involves reinvention that Dr. Turner is not sure NASA knows how to do, yet. Personnel have to be on the ground listening, and end users need to drive the work. Still, he said vertical scaling is the goal.

Dr. Searby added that it really matters who that 3,000 or 3 million is for targeted scaling. She said before it can be delivered to everyone, you need to define who ‘everyone’ is. Using the example of urban heat islands and the ARSET Urban Heat Island Training she framed the question, how do we take all these programs (e.g., ARSET, DEVELOP, SERVIR, HAQAST) and develop a new orchestra? How do you move phone use from accessing information about the weather to information about heat islands?

Mr. Schuler asked what it would take for Applied Sciences to create an urban heat dataset that is useful for a human being and that Google, Apple, etc. can integrate it into their weather app. Dr. Searby replied that, because it is a public-facing audience, it could be done. She said it is different than working with a city planner who is trying to design cooling centers, or the Centers for Disease Control (CDC), etc.

Dr. Wagner highlighted the statement Dr. Searby made that what the city manager needs is probably more highly refined than what Google would scrape and add as a layer. Dr. Saah wasn’t sure he agreed. He said the private sector is more sensitive to their quality of information output than most city managers, who don’t have the time, expertise, or resources to fine tune; Google has a whole effort focused on digging into heat island effects and how to incorporate it into their platforms because they monetize it. For scale, he wondered, how does one create the best data out there? You need to scale with information that is typically

accessed, consider using private sector partnerships or regional NGOs for penetration, and ensure trust at each level. The user needs assessment is direct, the buildup is direct, the analytics is developed...how do you open it up quickly and feed it into your partnerships? No one seems to have been able to solve the last part.

Ms. Price said you need to start with the needs of end users and intermediaries and determine where the channels are with existing user bases. Consider immediate users' first-level needs but also all the needs downstream and, also, the degrees of users within the downstream. For instance, in Kenya, is the end user the Ministry of Agriculture, a small holder farmer, or is it the Kenya Space Agency? When we talk about HAQAST, are we being intentional about who those super users are? Are we creating an echo chamber or are we being intentional about who we want those cadres of users to be? Who are the aspirational users based on your desired impact trajectory?

Dr. Wilkie said the variety of end users means a tailored solution for each. He suggested Blockbuster as an example of failed vertical scaling. He said Netflix figured out that to go from 3000 to 3 million users you can't stick with the same model, there is a need to change the delivery mechanism.

Dr. Dilling agreed with Ms. Price about understanding users first and, especially, levels of use. She mentioned the difference between scaling regarding data and how it replicates and the decision regarding how to scale the impact? She noted that, unlike Blockbuster, this is about public service messaging and resources, such as making sure we're building our cities to withstand heatwaves.

Dr. Wilkie offered other examples of scaling – Project Sunroof, Google's solar map for homeowners and solar developers in all cities to analyze placements of solar panels. It is valuable to homeowners, great for a city and city building planning, and great for a state to figure out how to use the most solar panels with the least environmental damage.

Mr. Anoubon Momo brought up the difference between your users' needs and your product. He said the product is not always the profit maker: products may be free and the ads create the profit and, in the case of sensors, the product does not make money, the data collected from the sensors does. Regarding the Google versus city manager example, the city manager is like today's farmer and Google is 5 to 10 years away. He wondered how to create value for the data NASA is producing. The data is more useful when more people are using what you generate. He suggested using a business model lens: instead of talking about generation, talk about downloading/use.

Dr. Saah said if you use what you currently have for solutions, you're not investing in the future. There is a need to focus on development and continuity, a continual flow of improved information over time. He noted that analytics are going to evolve rapidly and the way we do remote sensing will shift over the next 5 years via GeoAI. A sensor technology lag will lead to a tsunami of information to manage.

Dr. Dilling spoke of a new paradigm and the difference between farmers sending data via their phones versus data coming down from satellites. She said disruption is about letting go of the old and bringing in the new. The skills and capacities at NASA can connect data with users and the impacts of traffic going to Google and weather data going to people are profound.

Dr. Saah added that stasis will stall innovation on the ground. He wondered how to set up continuity and innovation in ways that are not mutually exclusive and talked about Landsat Next as an example. There is continuity and improvement, and deployment has elements for stability. He said innovation needs to continue at the same pace as the top of the pyramid.

Dr. Wagner asked the program managers (Drs. Searby, Haynes, Doorn, Turner) to speak briefly about the challenges of meeting users where they are. Although he loves the idea of a vertical approach, he sees the challenge and used the Surface Water and Ocean Topography (SWOT) mission as an example. The first step is trying to convince people the data product is useful and reliable, as was necessary in a project to measure water from snow in Colorado because water managers are not likely to trust your new-fangled satellite. Dr. Wagner said there are efforts to address siloed challenges with the latest NASA solutions; but there is not a vertical user to scale to. Even though it might help a billion people, users to make that happen would need to be trained.

Dr. Dilling said it is more than just a training issue, they have to trust it because it works and the user takes a risk if something new is wrong. It is on NASA to prove it is better and is important for early adopters to use it and say it is better; there are also people that could be considered nodes in the community, who everyone calls to discuss new technologies, who are important to the process.

Dr. Saah gave another example of an open source fire vegetation management tool that two large utilities said they did not want to use as free and open because they do not want to wind up paying for it once they have integrated it into their systems. They are more concerned with reliability (and are willing to invest if there is external support), than with best-in-class and free and open.

Dr. Wagner noted that vertical scaling is attractive, in general, but ideas to do it are still needed.

Mr. Schuler said that not everything should be considered for vertical scaling. The users matter; some data products only apply to 300 users. Is Applied Sciences interested in, for example, helping people make better decisions about developing housing that is not in disaster areas, by providing very high quality, high fidelity information available to companies like Zillow and Redfin? He suggested that the only way to make that happen is to get the scientists out of the data creation loop, where insight creation can be automated. He asked, should ASAC be focused on the 300 users making critical, unique decisions with no other data to serve them or is ASAC focused on big, far-reaching, societal issues, or both?

Dr. Kearns said he thought both can be done. The same data can be fed into multiple streams and have different goals and audiences. You can focus on one or go down partnered routes, which can be used to send data down various flows.

Dr. Wagner spoke about the Early Adopters Program: once the mission is flying, individual core programs in Applied Sciences compete to have people work with partners, then there is the larger consortia and more directed projects (e.g., the SPoRT collaborative, within which NOAA uses NASA algorithm data).

Topic for future discussion: Techniques to Approach Users. (Dr. Wagner)

Dr. Kearns said that NASA engages well with academics and universities, with NOAA not as well, and with private industry there is a big gap. He said there is friction there and not as many commercial folks at the table for these calls. He said the biggest source of friction is time and effort. When working with a government agency, time is not a limiting factor; with academics time is a limiting factor; on the private sector side, there is not a lot of time to discuss and debate. If there are not products that are ready today, that meet requirements, and will be stable, the private sector will walk by. That creates friction because you may have big users that will not deal with NASA but work with the fastest and easiest option. The trust issues are not as big as the time issues: NASA is perceived as authoritative, which is valuable to the private sector.

Dr. Saah said that sometimes NASA personnel does not trust the personnel in the private sector. Dr. Kearns agreed and said this is true particularly in climate services. There is also a misunderstanding – and a fear of overstepping – of how federal NASA scientists can work with counterparts on the commercial side; the federal employees do not know the rules of engagement. Dr. Kearns said that First Street has an agreement with NASA and there is still trepidation about sharing information.

Dr. Wagner asked Dr. Kearns what he needs that he is not getting. Dr. Kearns said the model outputs that have existed for 1.5 years are sitting on a NASA disk and First Street has not been able to access them, so they have developed their own model and will likely not go back to NASA's model. Dr. Searby asked, process-wise, how First Street got there. She feels that she and Dr. Karen St. Germain would have given the model outputs to Dr. Kearns. Dr. Saah said, typically, the private sector will reach out to the scientist who wrote a paper because they don't have access to anyone else.

Dr. Searby said that, this year, Lawrence Friedl was asked to take a new role as engagement officer to work with the private sector and partnerships as a full time job. The role has not been fully defined and Dr. Searby asked the committee for ideas to use that role as a bridge.

Dr. Kearns said the timing aspect is the thing, and not just with NASA, because the researchers never call the project done. He discussed policies for timelines and windows of time for information availability and that guidance has been shut down with the current administration.

Dr. Searby said that NASA and NOAA have diverged on this: NASA has leaned harder on openness, both because of the Science Mission Directorate (SMD) implementation and because NASA is not operational. She said, once you have a Space Act, that should enable people to talk to her and Dr. St. Germain for approval: a top down process. Dr. Kearns noted that the engagement is cultural and people don't want to jump chains, etc. Dr. Searby reiterated that the intent is to have an engagement officer available for that. The Earth Science Action Strategy cannot all be done with only NASA money and only NASA implementers. The intent is to have more Space Act agreements (100 with the private sector is not an unreasonable goal) working at a higher pace.

Ms. Price noted that the private sector is not a monolith. Dr. Friedl is working with philanthropies, publicly traded companies, perhaps startups; and incentive structures and risk tolerances are very different. She said some groups get into ruts having figured out how to work with certain partners. The partnerships piece will take a lot of time and people.

Dr. Sylak-Glassman said Applied Sciences did a private sector engagement process. They learned that private sector companies want access to scientist expertise and time more than they want access to funding. *Dr. Turner agreed in the chat and added that time is generally more precious than money.* They also discovered that the centers want ownership over partnerships and worry about losing potential partners if they were even to surface information with other centers or HQ, especially in light of a potentially reimbursable agreements with the private sector. There are center-to-center-to-HQ dynamics, individual-scientist to individual-organization dynamics. It was a surprising landscape.

The private sector engagement process study is internal, but there was a suggestion to discuss it at the next meeting.

Dr. Sylak-Glassman said it was facilitated by Research Test & Innovation (RTI) and they brought in folks from the private sector for perspectives. They talked with private sector engagement managers at other agencies, too.

Dr. Dilling added that a lot of these questions are cultural and regarding power, rather than just staff time. Dr. Saah said the value proposition may make people may be more protective with the private sector as opposed to an academic partnership. *Dr. Turner noted in the chat that private sector engagement is often limited/frustrated by lawyers' understanding of what NASA, as Feds, can do with private sector entities.*

Topic for next meeting: What Is the Private Sector Interested In? (Dr. Wagner)

Mr. Anoubon Momo said it is important at the start of an engagement not to feel like there is vertical engagement between the agency and the private sector. To wit, the private sector says we want to engage you and then finds the meeting is run by NASA. And NASA says, here's how we'll engage you and here's how you can apply the data. There is a lack of co-development.

Dr. Searby noted that NASA has not made decisions about incorporating all model outputs as part of open science in the Distributed Active Archive Centers (DAACs). That set of funding decisions is linked to the core problem: whether some of those things are made open or the model outputs are released within a certain cadence. *Dr. Turner noted in the chat that “open source science is an attempt to ‘rejump the open data shark.’”* Dr. Saah said that open data revolutionized the market and created a huge industry. Open analytics is the next phase and will have an exponential impact. Dr. Kearns said the code is available but to run the model again would be costly; it would be easier just to run another model. NASA’s experience with Landsat is the poster child for the open data argument. Any open data will go in the marketplace, it’s really about the timing and the form of distribution.

Mr. Schuler agreed that it is about how it is distributed. The other part of timing is how quickly it can get to users. Putting it on the cloud means my users can get this data in their browser in real time. Distribution not only on the cloud but in cloud optimized ways is important, so people can build tools on top of that data. That’s great from an Applied Sciences standpoint. Dr. Wagner noted that this made him think of the Earth System Observatory (ESO) and how that data is discussed.

Topic for future discussion: Model Outputs, Accessibility, Cloud, and ESO (Dr. Wagner)

Earth Action Program Structure and Team Members

Dr. Wagner reviewed the Earth Science budget changes, reviewing two lines under Earth Action: one is the old Applied Sciences programs, and one is a new line, Responsive Science Institutes (RSI). He then showed the 2025 budget numbers and projects via percentages. Dr. Searby noted that RSI is not technically approved, yet, except by the Office of Management and Budget (OMB) and that it has complex management structures: multiple stakeholders, philanthropies, other government agencies, so there is sophistication required to manage those programs.

There was a discussion about the R&A line item and acknowledgment that that nomenclature came from SMD owing to some divisions that do analysis but not research.

Dr. Dilling suggested looking at the numbers as a pyramid to address the group’s desire to assign resources to reach humanity versus, say, technology. Dr. Wagner said most of flight would be considered foundational; technology/the Earth Science Technology Office (ESTO) would be the bottom of the pyramid; Earth Science Data Systems (ESDS) would be the middle (they are moving in the direction of supporting Earth Action more); R&A has small equities with a lot of variety, so one third of R&A might be towards the top.

Dr. Dilling asked whether there is a shift in the 25% of R&A where more R&A budget is top of pyramid? Dr. Wagner said a brand new budget line is being created to do Radio Science Receiver (RSR) research. He noted that the Earth Action side of the house is user- and codevelopment-focused; the R&A side of the house is application-focused.

Dr. Searby discussed the goal to be more intentional about responding to user needs. She used sea level rise as an example: it used to be predicted out 100 years but has been backed to 30 years, which is a real-estate timeframe, although people may want to have 5-year predictions, which would be a flood insurance timeline.

In regards to the pyramid visualization of the budget, Dr. Wagner gave the example of the MAIA mission as a challenge. The total budget of around 60-80 million is in the flight budget, it's an Earth Action and Applied Sciences mission. MAIA will measure PM_{2.5} in cities around the world and is working on the ground with health care workers, etc. So, the pyramid lineup can be hard. Dr. Saah wondered, considering fears around instrumentation for maintenance and having enough R&A money, how to communicate resource distributions as not an "or" but an "and." Dr. Searby added that people assume, erroneously, that the research budget is all for basic research and the flight budget is all for basic missions. *Dr. Haynes added via chat that MAIA was the first funded mission that had a purely applied objective.*

Topic for future discussion: Highlighting Communications Strategy (The committee)

Dr. Wagner reviewed the staff on the NASA HQ Earth Science Division Earth Action Leadership Team. He said Applied Sciences was in very good shape. He answered a question about how the Satellite Needs Working Group (SNWG) and the Commercial Smallsat Data Acquisition (CSDA) teams work together by saying that, in general, CSDA buys data for NASA, and NASA allows anyone else in the government to access that data, whereas SNWG is generally focused on meeting some federal need and on NASA assets; they are currently not mixed and NASA does not want to get in the position of buying data for other agencies.

Discussion

Dr. Sylak-Glassman, in response to a sustainable development goals question, said those goals moved to Dr. Friedl in his engagement role, so the funding for engagement still comes out of the Earth Action, Applied Sciences programmatic line. Dr. Searby said sustainable development goals were a strategic organizing principle for the UN, and some are suited to remote sensing and some are not (e.g., making a difference for women and girls). There are about four areas that remote sensing really addresses (e.g., agriculture, food security). It has become a cross-check for whether everything possible is being done to address things the UN has identified as necessary. Ms. Price said that NASA assets, when combined with other data sources, can lead to huge insights about how women and girls move in cities, for example. Across the Smallsat Coordination Groups (SSCGs) there is underutilized potential for measurement against goals but also some operational pieces. Dr. Searby said the Synchronous Earth Observatory Satellite (SEOS) systems engineering office is maintaining the cross-check, NASA's and other international activities, but that has not helped make decisions about new investments.

Mr. Schuler asked what happens to proposals that come in that do not fit in an identified bucket, that don't rise to the level of having a permanent owner. Dr. Wagner said some could

come in under a ROSES element; there can be unsolicited proposals, but it is hard. Mr. Shuler was concerned about a general SNWG budget becoming a catch all.

Melissa Martin joined the meeting and introduced herself as the CSDA program manager and has been involved mostly in airborne science, to date.

Program Element Presentations, Part I: Program Elements Moved from Data Systems

Presentation: Satellite Needs Working Group (SNWG)

Natasha Sadoff, the new principle for SNWG and the Satellite Needs Program Manager for Earth Action as of January, defined the group: a biannual survey mandated by the United States Group on Earth Observations (USGEO) and funded by OMB to identify and communicate federal satellite earth observation needs. Ms. Sadoff described the survey process, which is a systematic process for review, including interviews.

SNWG, formerly housed in R&A and data systems, recently moved into Earth Action, which changes the types of solutions it generates. Ms. Sadoff's background is end user engagement, community building, and a human geography perspective and, with increased focus on the top of the pyramid, there is an effort meet the needs of partner agencies and look for solutions that impact the broader community.

Ms. Sadoff reviewed the Stakeholder Engagement Program (SEP), which is focused on raising awareness and offering training. The group is needs-driven via survey but needs to be more so and is working on the co-design and co-production piece. The agencies and stakeholders are being mapped for better context and ideation for co-development and prototyping of ideas.

She then reviewed sample solutions from SNWG from 2016 to 2020 and noted that they are very diverse, from data products to vegetation indices. She is interested in broadening solutions from data product heavy to more service-oriented solutions. Next, she reviewed the Harmonized Landsat Sentinel-2 (HLS) product, the second most downloaded product, which improves some Landsat latency challenges and addresses 20 agencies over 34 needs.

Ms. Sadoff reviewed examples of the stories of impact SNWG is now generating: the United States Department of Agriculture (USDA) using HLS for land and cattle management; the Observational Products for End-Users from Remote Sensing Analysis (OPERA) for vegetation loss analysis; and the Pandora project for improved air quality forecasts.

One of the most popular areas (67 needs across 24 of agencies) was making access to commercial data possible through CSDA with expanded End User License Agreements (EULAs). There is still a question about operational use; and there is a 30-day latency to ensure that they're not used operationally.

Ms. Sadoff reviewed activities identified in the 2022 SNWG analysis that are prioritized and waiting for appropriations. Then, she reviewed challenges, including usage, scaling, and impact.

There is a need to figure out how to co-design and ensure utilization, get feedback, scale, and consider sustainability post-SNWG.

She highlighted that SNWG is user-driven and service-oriented, that they reach across NASA, and work to maximize impact, be user-centered, scalable, and operationalizable.

Discussion

Mr. Schuler asked about moving from a data product focus and how that would make sustainability even harder and more expensive. Ms. Sadoff hopes that incorporating more co-design elements with agencies will help. She said it will take several years because it's a complex process: solutions, appropriations, and development. Mr. Anoubon Momo asked about licensing and availability and Ms. Sadoff said those details are covered by CSDA.

Dr. Saah, using the USFS as an example of a big complicated agency, asked how SNWG makes sure to have the right people in the room. Ms. Sadoff clarified that it is up to each agency and NASA does not control the survey. SNWG tries to explain, promote, and give guidelines for use of the survey across agencies. At the Environmental Protection Agency (EPA), for example, there are a lot of submissions from the office of water but not as many from other parts of the agency. NASA is currently at the mercy of agency representatives; and NASA can only control the exploration of agencies and understanding of their structure and interaction with data.

Dr. Saah asked how SNWG is looking for synergies between different agencies. Ms. Sadoff replied that, in the assessment process, SNWG looks for commonalities across requests and aiming for 80% satisfaction across agencies, rather than 100% satisfaction at a few agencies. That process takes 120 experts from NASA, NOAA, and the United States Geological Survey (USGS). In the past, scientists have been mostly from centers and R&A and a handful from Earth Action. Ms. Sadoff is trying to involve more people from Earth Action going forward.

Dr. Sylak-Glassman clarified the scale of this: budgetarily, it is roughly the size of multiple application areas. It's a big part of the RSI budget.

Dr. Dilling asked whether the grass example presented was Grass-Cast at USDA. It was not, so Dr. Dilling will connect Ms. Sadoff with the appropriate contact at USDA.

Ms. Price asked about the readiness/maturity of different agencies and suggested sharing that information among partners and agencies. Dr. Wagner agreed.

Presentation: Commercial Smallsat Data Acquisition Program

Dr. Melissa Martin, the CSDA program manager gave a brief overview of the program. She discussed the reasons that NASA buys commercial data and gave examples to show how commercial data is used in science research and applications, including some machine learning methods developed by CSDA.

Dr. Martin reviewed the CSDA program timeline from the pilot in 2017 to proposal selections and awards in 2022 and 2023 to the closure of recent on-ramp in 2024. Next, she reviewed the CSDA program goals and objectives. She highlighted the value of on-ramping commercial data vendors. She mentioned partnering with the European Space Agency (ESA) on their data buys and evaluations; USGS for evaluation; and the National Reconnaissance Office (NRO), the National Geospatial-Intelligence Agency (NGA), and NOAA for combining resources.

Dr. Martin discussed the data evaluation process for commercial data buys. She noted that CSDA is unique because they look at not only the data quality but also at utility for application. She then discussed the tiers of CSDA's EULAs. She clarified the status of derivative products from level one: those that cannot be reverse engineered are available for public release. *Ms. Sadoff added via chat that "through a submitted need from agencies – so they can now access our commercial data as well – very closer relationships between SNWG and CSDA!"*

Dr. Martin then reviewed the scope of program and vendor status. She talked about the transition phase under the indefinite-delivery/indefinite-quantity (IDIQ) contract and the timing of new competitive task orders. She clarified that, except for the Earth Digital Elevation Model (EarthDEM) which is not purchased but received from an academic institution, all the companies are either already under IDIQ or are being transitioned. She added that, in cases with only one data type, it becomes similar to a sole source.

Dr. Martin then reviewed CSDA data holdings and who can access what research. The costs associated with uplifting a license is tremendous and, over the next year, the program will look for synergies, i.e., working with other agencies to purchase higher license levels and open to public use.

In response to a question from Dr. Dilling about who these companies usually sell their data to, there was a discussion about various government agencies using this data and the example of Planet selling data to academic institutions for research. Dr. Martin talked about the stream of private company data being sold to users and NASA as a purchaser that shares the products with government or derives products that could be made public. Mr. Anoubon Momo said citizen companies are not making a lot of money from this. Ms. Price said government for defensive intelligence is their number one customer; then foreign governments for defensive intelligence, then big technology companies (e.g., Google, Amazon), then U.S. civil government, then foreign civil government. She noted that they have their own satellites. Mr. Anoubon Momo said there are big companies, like Airbus, whose U.S. business is less than 10% and they are the largest constellation of all private companies. Maxar makes most of their money on defense, but selling analytics rather than images: they collect data and provide analytics. Dr. Saah spoke about Planet's purchase of Salo, which takes planet data and creates derivative products. Dr. Martin says this can create challenges for CSDA, but as long as commercial products are not in the data catalogue and NASA cannot reverse engineer it, it is okay. She clarified that products are locked up if they are in the data catalog and that not everything has a 30-day window: supporting disaster work allows for data use as soon as possible.

Dr. Searby talked about Norway's purchase of data from the tropics and making it free to the public from Planet. It was a five-year deal and now Bezos has picked it up. Regarding vertical scaling, Planet was successful in getting two customers; Dr. Saah said the deal was more of an advertising deal than pure revenue. Ms. Price said if it is not a high interest area, they would rather turn it off. Planet made a smart move for public relations, but it doesn't help with pooling demand to open more data. Dr. Saah added that for their next set of acquisitions, Google asked research communities about their research sites are and said they would provide data on those areas. Dr. Dilling said the provision of evaluation and quality assessment that the government can rely on is almost like a seal of approval, very valuable to companies. Dr. Martin said CSDA also develops tools and provides them to users. She also mentioned that they have large companies but also smaller, startup companies: CSDA just changed their request for proposal (RFP) to include companies with only one satellite.

Dr. Martin reviewed CSDA's data usage by discipline across the United States Government Plus (USG+) users and said this will change over time and likely look very different next year.

Discussion

Dr. Martin said the interior still buys a lot of data for NOAA and there are other programs in government buying these products, and CSDA tries to ensure there isn't overlap. Dr. Sylak-Glassman said this is a prime example of the finding that the private sector highly values access to the best scientists in the world. The evaluation process puts the private sector companies in close connection with world-class satellite scientists to better understand their products and potentially make improvements. Mr. Anoubon Momo said that this type of collaboration is a classic partnership model, but what the private sector is really looking for is not a contract but actually co-developing products or informing or working together in designing projects.

Dr. Wilkie said it was fascinating that companies are flying Smallsats over areas where there's no commercial volume so they turn the satellites off. If it's commercially worthless but valuable to non-commercial users, you're in an interesting negotiation to buy that data. Mr. Anoubon Momo noted that there are places where it's always cloudy, so there is no value there. Dr. Martin confirmed that CSDA has some Maxar data from where it's always cloudy and NASA is aware of where things get turned off. Also sometimes companies pay to have things not be sampled, for intelligence concerns or other reasons, so the data is not available to NASA.

Ms. Price said she was excited about the Umbra stance for more open licensing and creative commons licensing is so important. Originally, PIs were cautious about using data that might not be available in the future; it was a circular problem: difficult to determine how the data would be useful if the user was unwilling to use it. The acquisition is important but the partnership is, too. Despite profitability issues, people at these companies would love to work with NASA scientists. She said there is opportunity to pool some licensing structures and, if NASA could time RFPs with companies' cycles, incentives could be well aligned. According to Mr. Schuler, Umbra is fully open, with attribution or similar.

Ms. Price asked whether NASA is also bringing in all the open data program data (there are five commercial providers with meaningful open data programs: Maxar, Capella, Umbra, Airbus, and Planet). Dr. Martin said they are only using Maxar data right now. It would be interesting to understand, of the openly licensed Maxar data (which is more humanitarian-focused) is there different adoption and uptake of openly licensed high resolution, even from the same source.

Dr. Dilling asked about a scenario where several NGOs want to pool their money, isn't their value in common data? There are groups of users that have a non-profit goal of saving the planet, in addition to government users, and need satellite data. Dr. Martin said, in a perfect world, all data would be public. Dr. Dilling said it may be a different program. Dr. Martin said CSDA has already gone through data evaluation, given the NASA stamp of approval, developed tools, and it would be completely open use. She said she struggles with students not having access to data in the classroom setting, except graduate students on a research grant.

Program Element Presentations, Part II: New Cross-cutting Program Elements

Presentation: U.S. Greenhouse Gas Center

Dr. Argyro Kavvada, Program Manager for the U.S. Greenhouse Gas Center (US GHG Center), began by recognizing both the NASA partners (EPA, NOAA, NIST) and her colleagues (Shanna Combley, Stakeholder Engagement Lead and Alix Kashdan, Program Coordinator) and also colleagues from the R&A program.

She reviewed the background on the center, including their pledge to reduce emissions, the national strategy, and role and mission. She emphasized the accomplishments of this effort and reviewed stakeholder-driven efforts, including user focus groups, stakeholder dialogues, and events and engagement, both domestically and internationally. For the upcoming stakeholder forum in December 2024, there is hope to have user testimonials about how they have been able to leverage the centers. US GHG Center met with government agencies in Japan, where there is interest in developing their own GHG center.

Finally, Dr. Kavvada reviewed what is upcoming: a few releases to the public-facing portal, data product updates, expanded collaborations, and the addition of user stories. Moving forward they'd like to share best estimates that demonstrate coordination across the U.S. government.

Discussion

Noting tension between needs and delivery, Dr. Dilling asked for clarification about the process and what kind of data was shared: what kinds of applications seem the most promising, what kind of data, at what resolution, and who is using it? Dr. Kavvada replied that there are a range of products shared through the portal, including a number of flux products, model estimates that share carbon or methane fluxes and are bottom up at resolution of about 50km (and also top down). *Ms. Kashdan added a link in the chat for the data sets currently available on the Center's website: <https://earth.gov/ghgcenter/data-catalog>.* Based on user feedback, in about a month, there will be improved resolution to 10km and also improved and routine delivery every

couple of months. They want to add products from the airborne data set side and integrate new data sets for more accurate estimates of emissions over particular areas, e.g. states. US GHG Center also has methane plumes from the NASA EMIT instrument at a resolution of 60m delivered regularly and will be adding emission rates. Through some visualization analysis capabilities on the portal, people can zoom in to the plumes to derive information, estimates, uncertainty estimates, etc. She mentioned that everything is open source. US GHG Center recognizes that current products don't meet the needs of more local users; there is ongoing work to improve resolution of existing products but also add new capabilities and develop new data set inclusion strategies.

Dr. Dilling followed up regarding time resolution and asked how long the delay is from what's happening on the ground to when you see the data? Dr. Kavvada replied that it depends on the data set. Some model estimates are available daily and monthly, with a 2-month latency rate; the goal is to get to monthly latency, especially with some international requirements. The EMIT data set is available more frequently, but goes through manual examination.

Dr. Kavvada said that the GHG website has a broad audience. It was a mandate from the White House to NASA and EPA, initially. NASA worked with EPA to identify focus areas and use cases for EPA and their stakeholders. Products were developed to inform improvements to future inventories but also support international reporting and engagement at state and city levels for tracking progress or meeting emission targets. Recently, they've completed many stakeholder activities and also started getting feedback from some state and city users. The audience is broad, and relevance spreads nationally, locally, and through government and science communities.

She added that, initially, the focus was not on compliance or enforcements but more focused more on tracking and reporting. Some needs that were identified: desire to leverage information to identify where improvements in inventory are necessary and to capture large emission events but they don't have capability currently. In the past few months, there has been interest to leverage empirical data, including data from satellites, to help identify and detect plumes and notify operators. The center would have an advisory role there.

Dr. Kavvada said, in response to a question about metrics about use and gaps, that there is a system in place to track access to and use of the portal, along with a biweekly report. Also, there are metrics for user focus groups, synthesis and types of questions and needs. Moving forward, GHG would like to track refinements, changes, and improvements to existing products versus new products. There will be a report provided to OMB and the Office of Technology, Policy, and Strategy (OSTP).

Dr. Saah asked to hear about major trends. Dr. Kavvada replied that there is still difficulty with the technical level of the data; city, state, and policy makers are not able to use it in its current state. Improvements range from portal design to how information is packaged and shared. They may be moving towards best estimate products for ease-of-use. EMIT data has a lot of active users (e.g. the United States Department of State, embassies), which demonstrates the

value of data and accessibility through the portal. Dr. Saah asked whether anyone has asked for templates for historic trends or aggregation for, say, a climate action plan? Dr. Kavvada said that is being explored and is expected, along with an effort to address cities. They are in discussions with ClimateAi and Google Earth Engine (GEE) to work together. The US GHG Center also wants to help set standards and best practices to facilitate the integration of the data into a spectrum of tools. They are looking at examples of partnerships and recognize that there is a need to enable users to integrate data into tools and systems that they are familiar with already.

Presentation: Earth Information Center

Dr. Eleanor Stokes, Program Manager of the Earth Information Center (EIC), began by saying that the Earth Science Division is pulling together scientists, artists, communicators, engineers, and visualization specialists to engage the general public and that they are in competition with the likes of Disney World for audience. There are new centers planned at the Smithsonian Museum of Natural History and the Kennedy Space Center Visitor Complex and different populations targeted there. Many people don't think of NASA as an Earth science institution, so that as a first touchpoint is innovative. The Administrator announced the center idea on Earth Day 2022 and the installation at HQ was complete by summer 2023. The goal was to expand the public's engagement with NASA Earth science to amplify its impact. There are six partner agencies: FEMA, EPA, NOAA, USGS, USDA, USAID and the Department of Energy (DOE) has expressed interest in joining. They are hoping to have one federal government Earth coalition working together to get the messages out.

Dr. Stokes said that the center is focused on public understanding and exchange, so they do relationship building, awareness, engagement, and education. She discussed the three goals of the EIC and highlighted that addressing access barriers includes helping people use data for decision making in their own lives, making it easy to use and not just available.

She reviewed the audiences that fall under the category of "the science-curious public" and said there is a place for the private sector, but that is as yet unclear. She also reviewed key themes and tone for the project, including taking politics out of the equation. There is focus on connecting global data to local lives and maintaining a positive and hopeful tone to give people inspiration and a connection and pathway to learn more.

Next, Dr. Stokes reviewed the major components in the installation, which were designed with various learning modalities in mind: Earth Pulse, Hyperwall (which she noted cost \$800K owing to the state-of-the-art pixel pitch chosen to allow for the potential to scale to Smithsonian screens, the Las Vegas Sphere, etc.), *Space for Earth*, and *Climate Legacies*. She noted that Earth.gov is the virtual center for the EIC and where all the interagency efforts for ESD will live. There will be an interactive map where you can explore data from different agencies and do simple analytics. She talked about the goal of having the interactive web capabilities be intuitive and easy to use.

Dr. Stokes then reviewed some first-year successes: more than 400 students, 2000 visitors a month, dignitary use, hill staffers, ESD and administrators office, etc. There was a soft launch of Earth.gov in November 2023; summer is the target for incorporating more data sets and UI/UX.

Some lessons learned regard heavy use and the level of engagement required for daily tours, the apparent usefulness of the center for developing partnerships, the amount of team time spent on things other than content creation. The team is trying to think of new ways to disseminate content widely that won't require boutique project time.

Dr. Dilling mentioned NOAA's Science on a Sphere as a comparator. Dr. Stokes agreed that a modular kit approach might work for disseminating content. Members of the committee offered ideas such as having a screen in a lab, playing a module 10 minutes before every IMAX movie, taking advantage of people's love of interactive exhibits.

Dr. Stokes reviewed what's next: there are more EICs coming soon: Smithsonian Natural History EIC featuring a 30' Hyperwall and the Kennedy Space Center Visitor Complex EIC opening as a whole building at LC-39 Gantry.

Finally, she discussed metrics and said, in addition to monitors and meters, the EIC has engaged a formal evaluation team to do surveys and interviews to incorporate feedback back into the production process. And there will be more metrics coming out of Earth.gov.

Discussion

Dr. Doorn noted in the chat that his team is bringing EIC content to the Hill next month and that it is a wonderful resource.

Dr. Saah asked about timelines and whether the wall can be streamed. Dr. Stokes said they are exploring two options: NASA+, a new channel could stream through ROKU, and a hyperweb (in the early stages) on Earth.gov is another way to stream. There was an in-room demo via laptop.

Dr. Stokes said she is so excited about the expansion (museum directors want it) and figuring out how to scale it. The evaluation is interesting owing to skepticism about the amount of data people can ingest and in what format, and for different age groups. Dr. Saah asked whether any of the learning about information digestion will be part of a feedback loop to other Earth Action teams? Dr. Stokes said this is a key part of the pyramid cycle for Earth Action and, although some will trickle down, she wants to formalize the dissemination.

Dr. Sylak-Glassman said it is a learning process for the whole team: do EIC and Earth.gov feel like everyone's resources? She said it will take time for this new type of resource and engagement, but the team has been providing more and more stories as Earth.gov evolves.

Dr. Wilkie wondered whether the content on the Hyperwall could be narrated, noting that the subtitles are at the bottom and could be missed. Dr. Stokes said they are developing an augmented reality where an expert will pop up with information, but the required quick

response (QR) code scanning is a barrier. She said taking advantage of the ubiquity of earbuds is interesting idea. Dr. Dilling wondered about the goal – is it data ingestion or more emotion/beauty/connection? How much do you want people to retain data? Dr. Stokes said it is important not to intimidate by the sheer amount of data, but rather make it more engaging or digestible. Dr. Dilling wondered about slowing transitions down. Ms. McMahon-Bognar said it seems that inspiration is the key [audio lost briefly].

Dr. Stokes said that a major theme is that earth systems are interconnected and that a couple of concept goals are incorporated in the evaluation to find out what visitors understand, how much do they trust the data/NASA, etc. She added that there are many child-led discussions with parents about these topics and that both children and parents can learn from this.

Ms. Price wondered how much the content could be curated so it's highlighting local data/use (e.g., Washington, D.C.: urban heat; Kennedy: disaster work), local heroes, localizing in general. Dr. Stokes agreed; Dr. Wilkie countered that the awe is so important and, although he understands the desire for local learning, the center could focus on the awe and drive people to NASA+ where they can see local content.

Dr. Kearns added that being able to zoom in locally, to an address, has been transformative for people. Dr. Stokes said they are working on a Hometown Dashboard, so people can send it to their screens or Facebook. Local videos are expensive, but some content based on data sets can be easily localized, i.e., Kennedy visitors will be able to see a sea-level-rise interactive.

Dr. Stokes said science, technology, engineering, and math (STEM) events are up to 150 people, but you don't want more than 40 people in the space for a tour. Dr. Wilkie mentioned a Bronx zoo exhibit where an ecologist wound back the clock and people loved putting in their address and seeing what their area looked like pre-urban development.

Discussion: Key Question: How do we best create synergies between the different program elements?

Dr. Sylak-Glassman said Earth Action's new elements being under the umbrella hopefully means that learning and lessons can be shared for efficacies and efficiencies. The question is with all these new elements and people, how can the mesh be built to make it all work better together?

Dr. Searby said the question is why are we all here? How do you find the right synergies to allow us to leap over barriers and help people be more resilient to this changing planet? Dr. Sylak-Glassman said that the urgency of the problems being faced requires accelerated processes and solutions to keep up with the pace of change.

Ms. Price said this comes back to what the impact trajectory is and what societal impact is prioritized: to talk about how to scale you have to talk about why and who you're scaling for. The impact of the synergies must be considered. If you start from a goal and backtrack to groups who can reach those end users, then you can determine the necessary synergies, and

you can start to decide which teams should be more matrixed. She noted that this is difficult to pull off and time consuming.

Dr. Saah said that the larger problem is a deal flow problem – enough opportunities through the system at the appropriate scales and you have the ability to do appropriate integrations in a timely fashion and communicate to a wide variety of audiences. Where are the key risks in setting up that infrastructure? Where are you focusing all your resources? And where do you need to spend more time thinking? Also, how do you ensure that touchpoints are proactive and not reactive or opportunistic? The infrastructure now has previous stuff and new stuff that is coming, which adds a new layer of complexity.

Mr. Schuler said that when you try to create synergies you can actually create constraints. It works best with very clear goals and strategies from the top; not a document, rather a phrase or a guiding principle. Then, capable people know the marching orders and can make decisions. As an example, “we’re not going to let the planet get more than 1.5 degrees warmer” is something people can think about in the shower and work towards making that happen.

Dr. Wilkie said organizational collaborations work well if there is a willing set of collaborators who sought out collaboration, rather than being told to. Any group that dictates synergies risks non-voluntary collaborations. Dr. Saah added that the incentive structures matter, too, and relationship could be an incentive if beneficial for both parties collaboratively and individually.

Dr. Wagner spoke to incentives [audio lost briefly]. Dr. Saah asked, for example, how do you get Wildland Fires to work with EIC. Dr. Sylak-Glassman said the performance plan is important: a score is directly tied to bonuses and annual leave. Also, there is a key deliverable requirement for cross-cutting efforts for an executive steering committee of colleagues with terms of reference and required meetings. Though not uniform, there are attempts to structure requirements or incentives. Dr. Wilkie said that Dr. Turner is managing scientists in the ecology conservation sphere and some of that overlap with wildfires and ecological systems are closely related. The kind of synergy he would like to see is more PIs talking to PIs. Dr. Sylak-Glassman referenced a toll carbon cycle and an ecosystems focus area with R&A together with Wildfire and Eco-conservation joint-PI meeting last year with featured focus sessions. There is consideration of whether NASA should be doing that on a larger scale. Dr. Sylak-Glassman said the goal for the meeting was mostly awareness building among related fields and looking for collaborations. Dr. Kearns suggested setting a target for those meetings and the phrase “a collision space with a goal” was surfaced.

Dr. Dilling wondered exactly why increased synergies were necessary, was it budgetary or otherwise. Dr. Wagner replied that there are synergies that happen naturally by sharing work. Mr. Schuler said he is less concerned about synergies within this group but more so for Earth Action interacting with parts of ESD that have other mandates. What are the levers or pain points in actualizing the strategy towards impact and what about data being used by the rest of the world that requires a whole agency effort over which Earth Action has no control. Dr. Wagner clarified the question about synergies: Earth Action is trying to find better ways to work

across the office, within ESD. For example, how is Earth Action going to work with ESTO, but also, how does Earth Action work with external partners. He noted that within the Earth Action office, synergies are formalized, already.

Dr. Haynes added via chat that HAQAST semi-annual meetings feature cross-pollination, e.g., with GHG emissions and wildland fires.

Dr. Dilling suggested a clarification: how does Earth Action feed into the machine of the agency or agency division? You do have to insert yourself and you have a mechanism but it could be strengthened. Some missions may not have a user base, but some need to consider how people will use the information. Dr. Wagner said that the Earth Action staff could be working more closely with data systems and are looking for feedback from ASAC on that.

Mr. Schuler said that, if NASA's goal is to expand to non-scientist data users, there should be someone who is part of Earth Action in every DAAC.-Dr. Saah added that Earth Action should also be finding synergies with emerging technologies and emerging science; the data science conversation and GeoAI – it sounds like there is a gap there. How does this instrument fit with what is happening in academia and the private sector.-Dr. Wagner asked whether that should be a priority for Earth Action. Dr. Kearns said it depends what Applied Sciences is shooting for; if it is the utilization of NASA data for the good of mankind, then the modern analytics are necessary to do that well.

Mr. Anoubon Momo said that private sector engagement is the part that is missing. Private sector engagement should start with “this is what we are trying to accomplish, this is what we can do, and this is what is missing.” And considering the pieces that are missing, how can the private sector complement what we have? For every element, there is an area to which the private sector can bring something. If it is altruistic, let's find a mechanism to do work with them; if a part of business, let's talk about acquisition. The private sector is not only the Googles, Planets, etc., small private companies, where most of the development in AI is coming from can also help. NASA needs to start thinking what don't we do, what don't we know how to do, what do others do better than us...and go to the private sector.

Dr. Saah said it is about seeing what's coming down the pike and partnering intentionally. Mr. Schuler talked about the example of the NASA/IBM foundation model, does Applied Science have any efforts to help partners retrain or use that in programming and feed information back to the development and benchmarking of the model? Dr. Searby mentioned the Global Modeling and Assimilation Office (GMAO) and the modeling managed out of R&A right now. She said Making Earth Science Data Records for use in Research Environments (MEaSUREs) is another place that data systems do some kind of innovation, but these are not very holistic.

Dr. Wagner reflected what he heard: we often think about how to serve the private sector or we buy stuff from them and we deal with different parts of the organization. At HQ, the focus is administrative not directorial.

Dr. Brad Doorn said, while complicated, it is essential to find a solution. He gave the example of climate smart agriculture. Producers are saying they don't need more data, they need NASA to control the data storm because when USDA puts out billions of dollars, a lot of people put out a lot of solutions (e.g., working with the drone industry is attractive but challenging).

Dr. Saah said there are many startups addressing every possible need for AI. Developing solicitations to incentivize groups' participation would be helpful, whether the integration of data science as a requirement or streamlining the solicitation process, and tagging into private sector groups building GeoAI and asking about transforming data so that it is useful.

Dr. Wilkie said NASA produces raw data and derived products, but maybe not products that are accessible to a non-technical audience. Should NASA be looking at the proverbial last mile of delivery of derived products or are there little private sector companies who could do that? Mr. Anoubon Momo said that the NASA International Global Navigation Satellite System Service (IGS) produces a lot of information and special companies use NASA data to calibrate their instruments and do the Global Navigation Satellite System (GNSS) work; the private sector gets accused of using the data for free and making a lot of money.

Dr. Dilling suggested that for synergies, the two different types of groups (subject matter groups and functional groups) could be paired, topical and functional. This way needs and issues could be exchanged and compared across topics and functions.

The group then returned to Dr. Saah's point about the need for advanced analytics (i.e., GeoAI and data science). Dr. Wagner said there are things, such as the cholera and mosquito forecasts, that combine advance modeling and satellite data for forecasting. Dr. Saah clarified that there are new data science departments and programs working with experts for new solutions and that reconfiguration with the private sector needs to be acknowledged, mimicked, or integrated at NASA. And, the next step should be inside the data science sphere where GeoAI sits and it needs to be programmatically built for projects to use. The value of data becomes the encoded embedding. Mr. Schuler wondered whether Earth Action is ready to deploy AI-based models if they outperform physics-based models. Dr. Wagner said the Goddard Earth Observing System-5 (GEOS-5) and Coupled Model Intercomparison Project (CMIP) outputs are the big models that Earth Action relies on, and they are not based on that kind of an approach. It was offered that the real application is to train the artificial intelligence (AI) off the model outputs. Dr. Wagner said the framework is different: Earth Action gets the remote sensing data together and there is a physical model. It was suggested that AI could come in later in the process, i.e., to optimize resolution after data collection. Dr. Saah recommended backing out from specific use cases and thinking about effort and expenses from a broad view digested into a domain-specific foundation model built for that domain's programs. He said there is use flexibility, then, because the system is already paid for. Dr. Wagner asked for an example of mapping mangroves worldwide and Dr. Saah said he could do it in two minutes.

Dr. Searby said, until you have a user, this does not matter. Dr. Saah said the coming business model is about creating trusted, basic building blocks to help acceleration: Earth observable

foundation models and being able to aggregate massive bodies of knowledge and integrate them. Dr. Kearns gave an example of students spending 80% of their time on data analysis and 20% of their time answering questions; if that flips, it will be transformational and advance the pace of science. Dr. Wagner asks for clarification on how this comes together and Dr. Kearns replied that the high quality data are already there but need to be integrated with AI that can learn and train off the model; so questions are answered quickly, based on what AI has learned from the models. Dr. Wagner asked about the use of digital twins; the group was not enthusiastic. Mr. Schuler said there is a lot that can be done with modeled data that was not possible before; he thinks there is something there in terms of spatial computing and what it can do for visualizing and interacting with information. He added that one promising area of AI seems to be very good at predicting 4th, 5th, and 6th order effects of complex systems, which allows for interrogation of things that would not have been possible previously.

Presentation: Replication in SERVIR

Dr. Searby started by mentioning that Dan Irwin, the SERVIR Global Program Manager, and Ashutosh Limaye, the SERVIR Chief Scientist, were joining via Webex. Then she described SERVIR, a joint initiative of NASA, USAID, and leading geospatial organizations. SERVIR describes what they do as services, rather than products, so things can remain fluid. SERVIR aspires to connect space to village. Dr. Searby reviewed, as an example, SERVIR's journey in land cover mapping in Eastern and Southern Africa, which engaged users to generate harmonized land cover maps. It was not used at all in the beginning but found a meeting place, and GEE has found a way to enable an annual update. They are now coming back and wanting money for what was free.

Next, Dr. Searby reviewed the regional approach in Asia. It started with people already using satellite datasets and in land cover mapping and moved to enabling governments to tailor maps to their own needs. She noted that sharing and replication between hubs has gone well.

Dr. Searby then reviewed work in West Africa. Despite a lack of use of satellite data sets and also trust, initially, an existing land cover map and collaboration enabled a collaborative initiative of which the SERVIR West Africa hub is a part. The design included a side-by-side implementer from the United States to get contracts set up, and getting money into right hands took a couple of years. The taskforce has been meeting for 4 to 5 years. Dr. Saah added context about on the ground trust building.

Dr. Irwin added via chat that "having a long-term, sustained relationship through SERVIR has been crucial to building and maintaining trust."

Dr. Searby then reviewed the success factors for replication, including a mature network of regional hubs, a broad portfolio of services and tools, and a culture of replicating and scaling. Then, she discussed service-level success factors.

Dr. Saah said that the way NASA invests in SERVIR, with coordinators and scientific leads, is incredibly effective for the intention to hit appropriate scales. Dr. Searby agreed and mentioned

the tiered technical and scientific backstopping, along with the Space Optical Communications Research Advanced Technology Satellite (SOCRATES). SERVIR has tried to bring the Theory of Change (ToC) into Applied Sciences but has not been successful. Dr. Wilkie said not all of his field programs have a ToC but they do field site-based after action reviews (“pause and reflect sessions”) for amazing team learning in which they ask the following: what they were trying to achieve the last 3 months, what seemed to work well and why, what did not seem to work well and why, what do we need to continue doing, and what should we do differently? Dr. Saah mentioned that a working group out of the SCO has been doing open machine learning workshops for 5 or 6 years, with a desire to train the network to do this. Every week they have a GeoAI workshop and someone from the community comes to present a solution. They open up the code base and the data base and it is recorded and now there is a catalog of all the information. The body of knowledge is now being turned into a book.

Dr. Ashutosh Limaye noted in the chat that “SERIVR is using GEOS-CF forecasts and using ground observations along with machine learning to improve localized forecasts.”

Dr. Searby noted that SERVIR is proud to have an 18-year run with USAID, which is unique.

Ms. Price asked about the GEE conundrum and whether there are lessons learned by partnering so deeply with the private sector. It’s a matter of economics. Digital Earth Africa is another conversation. The USAID/NASA exchange is also very interesting, even outside of the hubs.

Dr. Searby said that Kerry Stokes is the mother of SERVIR, co-created with Dr. Irwin. Kevin Horn is now working at the SCO, so there is good cross fertilization. There is a NASA/USAID memorandum of understanding (MOU) that is important for disasters but could be broadened. At a recent meeting, Dr. Searby was met with much dismay when she noted that they may not have GEE because it is unaffordable. She added that payment models are still a challenge, especially regarding the long lead or collaboration times.

Presentation: Scaling in OPENET

Dr. Brad Doorn noted that Open Evapotranspiration (OpenET) is a ROSES 2016 that exploded and forces scaling issues to be dealt with ad hoc. Dr. Forrest Melton said that OpenET was created because, in almost every needs assessment, field scale evapotranspiration showed up at the top of the list in the west. A consortium across organizations, agencies, and universities built OpenET, providing field-scale evapotranspiration data at daily, monthly, seasonal, and annual time scales for the 23 westernmost states. The spatial scale allows the project to resolve consumptive water use for individual fields but also within fields, across fields, and across time.

The workhorse satellites are Landsat 8 and 9 but OpenET uses a constellation of satellites to drive the ensemble of models. The data has been precomputed to make it as easy for end users to access evapotranspiration data as it is to access information on precipitation and rainfall. OpenET has also added short-term forecasts for farm and ranch management tools – an internet connection gives access to the same data at the same time as government agencies get it.

OpenET, using GEE, has been a powerful tool to improve consistency and quality of the inputs used to drive models, and to collaborate on improvements, and to streamline the data services. Dr. Melton said the Earth Engine (EE) team has been a really strong advocate and partner. There are some pressures and misalignment of goals, but the team is collaborative and supportive.

Dr. Melton noted that OpenET was developed around use cases and reviewed a few: the Upper Colorado River Commission adopting the EE metric model in OpenET to replace the approach they had been using for more than 70 years, which they have said is game changing and allows them focus on solutions as opposed to who is using what; the Sacramento San Joaquin Delta, where last year OpenET was used to streamline water use reporting, saving producers in the Delta more than \$29M and offering a process that takes 5 to 10 minutes instead of 4 to 8 hours.

OpenET is helping rural communities, water managers, policymakers, and farmers in a variety of water use projects, including budget, incentive, tracking, and supply issues (i.e., to “maximize crop per drop”).

Dr. Melton reviewed the 2024 OpenET User Applications Conference: 249 attendees, 156 organizations, 32 states, 8 countries. He said a number of the talks are on the OpenET YouTube channel. He added that it would have been difficult to pull off as NASA, alone, and it highlighted the importance of their partnerships with NGOs and groups like EDF.

He then discussed the success of OpenET: it is based on more than files, or a web-based interface, or catalog of data products, etc.; they have built an OpenET API to help facilitate retrieval and integration and support. The fact that it has been designed around specific use cases and requirements helps in scaling.

Dr. Melton reviewed the number of users and data retrievals, which have come without advertising. They track usage by user type and application, and there is significant usage from the research community and also from the practitioner community. He showed a breakdown by usage types and the ways the data is being used.

Dr. Melton then talked about research to operations (R2O) status, noting that an OpenET nonprofit has been formed; USGS and NASA currently share responsibility for the R2O process. He reviewed costs, funding, and efficiencies. He added that scaling costs are not linear: for each new region, there are initial set up costs and the establishment of new partnerships and use cases. Some costs can be optimized over time and there are some economies of scale for computing itself, but you do need to increase funding to expand to new regions. Data storage costs, as they are expanded in area and time, become exponential. Outbound data casts, as usage grows and more agencies adopt use, can cause exponential growth in data costs. The key is that the user support costs are not well-supported by any individual entity over the long term and that can become exponential and overwhelming. It’s one thing to produce the data, it’s another thing to ensure it is being used for client impact and win-win solutions.

Dr. Melton reviewed elements of successful scaling, including specificity of purpose or use cases, flexible and scalable architecture, strategy and resources for accuracy assessment and validation, attention to regional considerations, strategy and resources for user engagement and support, and the ability to say no.

Dr. Melton closed his presentation with acknowledgement that OpenET would not have been possible without the consortium of partners and the unique collaboration across organizations and agencies and more than 4000 partners from the agricultural water resources management and conservation sectors.

Ms. Price asked why it was necessary to stand up a new nonprofit as opposed to transferring to EDF or an existing nonprofit. Dr. Melton replied that many existing institutions had limitations, such as an inability to partner with certain other organizations. Because it was a consortium, there was some risk to disruption if one partner took over hosting or controlled funding. The decision to create a new nonprofit came with tradeoffs in effort and staffing. Dr. Melton said the structure of governance and the board plan was recently drafted and is in review. Initially, the nonprofit had people who had been involved on the funding side (from EDF, the commercial sector, the open source software community, and philanthropic foundations). Moving forward, the governance strategy allows the consortium members to have an informal advisory group providing non-binding recommendations but not receiving funding, for ethical reasons. Mr. Melton is willing to share the governance plan with ASAC when it is complete.

Dr. Melton said they considered a subscription model and that may be rolled out in the future, especially for consulting agencies. Initially, it did not make sense owing to infrastructure costs. It is tricky to maximize open data and also have a charge structure, although open data does not equal free data. For some states, there is essentially a subscription model to streamline the contracting process.

Addressing a question about people using OpenET products to create other products, Dr. Melton said a number of commercial companies incorporate the data into irrigation scheduling tools, convert ET data to an irrigation system run time or try to optimize timing for time-of-use pricing for electricity. Tools may be used to plan drainage systems, manage wetlands, or assess impacts of a burn area post-wildfire.

Dr. Doorn added that one struggle was identifying NASA's role over the long term, outside of providing data and collaborating internationally, considering the need for NASA expertise. How do you maintain a role as you scale and find successes? Dr. Melton said that, for OpenET, there is a critical science role for NASA to continue to improve models, reduce error and uncertainty, and incorporate new measurements. And having NASA involvement is an essential element of trust for agricultural partners.

Dr. Turner asked about the Center options and wondered about the down sides. Dr. Melton said there was no funding available and getting reimbursable agreements through the centers would have caused the project to die.

Mr. Schuler said this was a ROSES project that ended but the value was recognized so it continued. He asked how that happened and how it could be replicated. Dr. Doorn said they would not necessarily want to replicate it: Dr. Melton led the science component, but with a structural problem at NASA regarding dealing well with success, they had to cobble relationships and ROSES grants together. That and the time commitment are key challenges on the scaling issue. Dr. Melton said, with intentionality, funding agreements could be set up earlier, but that requires engagement at the agency leadership level for budget planning and support.

Dr. Turner said that for most of the last 20 years in Applied Science, there has been a desire not to scale. Scaling meant operationality and commitment to long term monitoring and unsustainable budgets and losing the research and development character at NASA. Now, even though it's the right thing to do, moving towards scaling goes against the foundational program culture. Dr. Melton added that NGOs can be important partners in that process.

Dr. Dilling talked about the difference between operational versus sustained operations. The more you have to commit over a long time the less you can do new things if budgets are flat.

Topic for future discussion: How to Approach Balance of Operational Issue – Earth Action Level or Leave to Program Managers (Dr. Sylak-Glassman)

Dr. Dilling said the spin-off is the key; no project is forever, but if you're innovating, a good handoff is the goal. Mr. Schuler noted that even identification and handoff takes resources; maybe there could be a ROSES Phase II where one or two things are identified for additional resources, for things that deserve spin-off. Dr. Kearns said that the problem with Small Business Innovation Research (SBIR) is that it is aimed at government acquisition, but perhaps the spin-off solution is more incubator style that industry could take up. Mr. Schuler said a startup mentality is necessary to get the thing started.

Mr. Anoubon Momo said that SERVIR is collaborating with another government agency and working with the private sector, and OpenET is a ROSES program that became a program itself; and those are what scaling is all about. With SERVIR, it is almost like a franchise: other countries may want to replicate it and other agencies may want to fund it. It is not a competition, the question is how to embrace other organizations for collaboration. Dr. Saah responded that, looking at these programs as business models, one or two are major examples of where scaling could work and then there are smaller examples. He asked about collecting information on lessons learned from each. Dr. Wagner said there has been consideration about reporting on that at a future meeting. Dr. Saah said that would inform scaling conversations across the board. Dr. Wagner said that already happens organically in some cases and it was suggested that formalizing that, e.g., creating templates, might be valuable.

Katie Baynes, Director of Data Systems, joined the meeting.

Public Comment Period

The public comment period opened at 4:05 p.m. There were no comments.

Findings & Recommendations

Dr. Wagner offered guidance to the team: he said he was especially interested in synergies and foundational models that may help with scaling and the difference between horizontal and vertical scaling.

Dr. Saah added that private sector friction, and partnerships related to that, is important to include. He said scaling out of the organization should be considered, including the trust within a consortium framework and what happens if a group breaks trust. Also compute strategies: what is that, how does it work, how is it being framed?

Dr. Dilling said the idea that success is a problem at NASA indicates a need for a plan, a model for success and/or scaling. NASA is so project focused, it doesn't lend well to building on successes.

Dr. Sylak-Glassman asked what would be Earth Action's job in supporting data systems to support end users in terms of models, analytics, expertise, etc.? Where does NASA look successful, now, that may be obsolete in the future? Where else does NASA need to train trainers? Do we need a ToC model for part of Earth Action or Earth Action as a whole? Where things are going: digital twins versus GeoAI?

Dr. Saah wondered if it would be helpful if the committee created a 1- to 2-pager on what GeoAI is? There was agreement that, though appreciated, it is not necessary for this committee to take on and that there are existing materials. Dr. Saah thought, based on the experience on ASAC, it would be worth it. *Dr. Turner put a link in the chat: <https://www.esri.com/en-us/capabilities/geoai/overview>.*

Dr. Wilkie said Dr. Melton's presentation was fascinating. OpenET was really successful, well received, and saved farmers money. The fact that it's a not-for-profit organization trying to run this when it's hearing a big market signal, it is baffling that the team doesn't want to spin it off as a for-profit entity. It was noted that it is an academic open-data, open-science mentality. The point about NASA's response when a NASA project allows others to make money has come up with other project products that have a market. NASA leans into allowing others to profit from it, at an individual organization level.

Dr. Saah noted that, strategically, a market will mean that products will be well supported over time by external advocates. Dr. Kearns said that NASA scientists are always worried about private sector use and credit and, then, appropriations to NASA taking a hit. However, as soon as Congress cancels a program that companies depend upon, they start getting calls.

Dr. Saah asked for reflections from the ESAC meeting on April 16, 2024.

Mr. Anoubon Momo asked, regarding the ToC, whether there is a way to have interior change at the division level. Everything created has a purpose, so the question is can we reverse and say at the ESD level what is our ToC and start thinking about all the programs coming together to meet that ToC at that level? It will make communications with ESD easier, because ASAC and others will understand what you are trying to achieve.

Dr. Searby talked about translating from NASA to USAID/development language, where “theory of change” comes from. So, for SERVIR, there is a program-level ToC and service-level ToCs. In NASA speak, there is a strategic plan with goals and objectives; USAID uses ToC. It is valuable to have both perspectives. Dr. Searby offered to bring in USAID colleagues to do a ToC primer. ToC helps identify your hypothesis of intervention and why you think it’s going to work; then you design around the intervention and measure intermediate results and outcomes to get to impact. Dr. Searby thinks if you looked at a global analysis of the Global Assessment Report on Disaster Risk Reduction and the highest vulnerabilities, the ToC would be “I’m going to reduce the likelihood of that disaster in this population and this location by x.”

Dr. Wilkie liked the notion of ToC because, for field teams, it reduces leaps of faith and magical thinking. Dr. Dilling discussed a ToC assignment she gave to students. She said the assumptions uncovered are amazing.

Dr. Searby thought that pieces of ToC are already in action at NASA. When people write a solicitation, they’re listening to the scientific body of knowledge and trying to address those gaps; however, there’s a methodology of measuring that isn’t done enough. Ms. Price wanted to know, with a new strategy, what is the reporting and measurement about the last one? ToC allows for interrogation of the strategy that is more actionable.

Dr. Kearns noted that this is the most significant reboot of Applied Sciences for two decades and that there is great leadership and a great vibe on the team, so there is a chance to take advantage of this opportunity at this point in time, especially when there is a national emergency around climate, and NASA is in a perfect position to lead. Dr. Searby noted that a change management team supported Applied Sciences’ organizational development. Dr. Dilling agreed that the spirit of the team was important and that the meeting the day before (of ESAC) was practical and genuine.

There was discussion about whether a joint meeting between the two groups would be more valuable than the split-meeting format for this meeting. Dr. Wilkie would like ASAC to sit in on an ESAC meeting and vice versa. He would like less of a focus on progress metrics and more of what is on the horizon. There was discussion about potential places to sync, shared themes, integrated ESO, and maybe some targeted topics. There was a suggestion that the chairs could have a conversation to exchange information about the committees. Dr. Saah agreed to that.

Dr. Saah thanked the supporting staff and Ms. McMahon-Bognar thanked the team.

Adjourn

The meeting adjourned at 4:38 p.m.

Appendix A Participants

Applied Sciences Advisory Committee Members

David Saah, University of San Francisco, *Chair*

Christine McMahon-Bognar, NASA Headquarters, *Executive Secretary*

Anoubon Momo H. Anoubon Momo, GeoDEV International

Lisa Dilling, Environmental Defense Fund

Edward J. Kearns, First Street Foundation

Rhiannan Price, DevGlobal

Ian Schuler, Development Seed

David S. Wilkie, Wildlife Conservation Society

Danielle R. Wood, Benesse Corporation (via Webex)

Other

Katie Baynes

Brad Doorn

Jeanette Edelstein

John Haynes

Dan Irwin

Argyro Kavvada

Melissa Martin

Forrest Melton

Amanda Moore

Amy Reis

Natasha Sadoff

Eleanor Stokes

Woody Turner

Appendix B
Applied Sciences Advisory Committee Membership

David Saah, Chair

University of San Francisco

**Christine McMahon-Bognar, Executive
Secretary**

NASA Headquarters

Albert H. Anoubon Momo

GeoDEV International

Lisa Dilling

Environmental Defense Fund

Edward J. Kearns

First Street Foundation

Rhiannan Price

DevGlobal

Ian Schuler

Development Seed

David S. Wilkie

Wildlife Conservation Society

Danielle R. Wood

Benesse Corporation

Appendix C
Agenda

**ASAC Meeting
NASA Headquarters
Third Floor, Room 3W42**

April 17, 2024

8:30	Call to Order	C. McMahon-Bognar
8:35	Public Comment	Open
8:45	Opening Remarks	D. Saah
9:00	Intent for ASAC Engagement from Earth Action	T. Wagner
9:30	Discussion	
10:00	<i>Break</i>	
10:15	Earth Action Program Structure and Team Members	T. Wagner/E. Sylak-Glassman
10:45	Discussion	

Program Element Presentations, Part I: Program Elements Moved from Data Systems

11:00	Satellite Needs Working Group (SNWG)	N. Sadoff
11:15	Discussion	
11:30	Commercial Smallsat Data Acquisition Program	M. Yang Martin
11:45	Discussion	
12:00-12:55	<i>Lunch Break</i>	
12:55	Welcome Back	D. Saah

Program Element Presentations, Part II: New Cross-cutting Program Elements

1:00	U.S. Greenhouse Gas Center	A. Kavvada/S. Combley
1:15	Discussion	
1:30	Earth Information Center	E. Stokes
1:45	Discussion	
2:00	Discussion	D. Saah
	Key question: How do we best create synergies between different program elements?	
2:30	<i>Break</i>	
2:45	Scaling Approaches and Challenges	T. Wagner
2:50	Presentation – Replication in SERVIR	N. Searby/D. Irwin
3:10	Presentation – Scaling in OpenET	B. Doorn/F. Melton
3:30	Discussion on Scaling	D. Saah
	Key question: How do we cultivate concepts from the beginning that are likely to scale?	
3:50	<i>Break</i>	
4:05	Public Comment Period	
4:10	Findings & Recommendations	
4:30	<i>Adjournment</i>	