**NASA DEVELOP National Program**

**2017 Summer Project Proposal**

**NASA Goddard Space Flight Center**

**Niger-Mongolia Water Resources**

*Implementing a Global Tool Based on Spatially Continuous Precipitation Analysis for Resiliency Monitoring and Measuring at the Community-Scale*

**Project Overview**

***Project Synopsis*:** Expand the current NASA + Mercy Corps partnership by including precipitation analysis (i.e., spatial and temporal trends) within the integrated approach to resiliency measuring and monitoring that the two organizations are jointly working towards. Tools created here build off learning from the Middle East Water Resources project (Summer 2016) and understanding from Mercy Corps about the types of analysis that work best when engaging with communities across the globe. In addition to creating an additional layer of information for the larger resiliency tool, products from this project will also be applicable in day-to-day operations for Mercy Corps field teams as soon as the products are delivered.

***Community Concern:*** Resiliency – the ability to recover from or adjust easily to change – is a critically important factor in the field of international development. Since Mercy Corps’ work often takes them to places characterized by fragility and crisis, being able to identify and ultimately address the underlying vulnerabilities of communities helps Mercy Corps foster beneficial impact to a community’s ability to get ahead. Mercy Corps’ approach to resiliency ([here](https://www.mercycorps.org/sites/default/files/Resilience_Approach_Booklet_English_121416.pdf)) in-part considers “resiliency to what” to identify the shocks and stressors that a community must be resilient to, and these “to what” items often consider environmental factors like drought.

***Source of Project Idea:*** This approach to resiliency measuring and monitoring has been generated through multiple years of planning between the joint NASA + Mercy Corps team, but most recently Mercy Corps has suggested a near-term focus on water resources as it is a global cross-cutting topic of interest for the organization and their stakeholders. Researchers at NASA Goddard Space Flight Center are currently undertaking a groundwater and surface water analysis, and precipitation has been identified as a needed additional layer for that work and for Mercy Corps operations.

***National Application Area Addressed:*** Water Resources

***Study Location:*** Niger and Mongolia

***Study Period:*** January 2000 – May 2017

***Advisors:*** Dr. John Bolten (NASA Goddard Space Flight Center), Dr. Kenton Ross (NASA Langley Research Center)

**Partner Overview**

***Partner Organization(s):***

|  |  |  |  |
| --- | --- | --- | --- |
| **Organization** | **POC (Name, Position/Title)** | **Partner Type** | **Boundary Org?** |
| Mercy Corps | Eliot Levine, Senior Climate Change Advisor & Danielle Jolicoeur, Regional Resilience Advisor for North, West, & Central Africa | End-User | Yes |

***End-User Overview***

***End-User’s Capacity to Use NASA Earth Observations:***

*Mercy Corps* – Mercy Corps has limited experience using satellite-derived information and no internal capacity to download and analysis Earth observations.

***Dissemination by Boundary Organizations*:** Mercy Corps has extensive in-country staff (e.g., field teams) and direct relationships with country-level groups (e.g., ministries) and communities that eventually will utilize products produced by this project. Though dissemination will depend on final decisions regarding geographic focus, Mercy Corps will ensure that products will receive input from and handoff to their in-country staff and country-specific stakeholders.

***Project Communication & Transition Overview***

***In-Term Communication Plan*:** Both Eliot and Danielle will serve as main POC’s for Mercy Corps and will facilitate contact with in-country stakeholders as needed. Currently, the NASA + Mercy Corps partnership team meets bi-weekly on Mondays to discuss updates and next steps, and the DEVELOP team could integrate into these meetings as needed to ensure coordination with the overall project.

***Transition Plan*:** Transition will occur to both Mercy Corps and the NASA team supporting the partnership. Mercy Corps will be able to implement the products as soon as they are available to them, and the NASA team will ensure that the products are included in the resiliency tool being created. Software release will likely be required.

**Earth Observations Overview**

***Earth Observations:***

|  |  |  |
| --- | --- | --- |
| **Platform & Sensor** | **Parameter(s)** | **Use** |
| **TRMM, TMI** | Rainfall accumulation | TRMM data will be used to create a precipitation climatology |
| **GPM, GMI** | Rainfall accumulation | GPM data will be used to create a precipitation climatology |
| **SRTM** | Digital Elevation Model | SRTM data will be used to understand elevation and to delineate watersheds |
| **GRACE** | Groundwater | GRACE will be used to understand the current groundwater and assist in identifying areas where groundwater can be extracted for schools |

***Ancillary Datasets:***

Mercy Corps – Social, economic, market, and governance data – Provide context for precipitation trends so that deeper understanding of community resiliency to shocks and stressors can be identified

***Software & Scripting:***

Esri ArcGIS – raster and vector processing and manipulation, statistical analysis, map creation

Exelis ENVI – image processing of Landsat, MODIS, and DEM data

Google Earth Engine – raster processing and data visualization

**Decision Support Tool & End Product Overview**

***End Products:***

|  |  |  |  |
| --- | --- | --- | --- |
| **End Product(s)** | **Partner Use** | **Datasets & Analyses** | **Software Release Category** |
| **Seasonal Rainfall** | Identify community and country resiliency characteristics tied to precipitation | TRMM and GPM precipitation data | N/A |
| **Rainfall Climatology** | Identify community and country resiliency characteristics tied to precipitation | TRMM and GPM precipitation data | N/A |

***End-User Benefit*:** Products generate by this project will enhance Mercy Corps and its in-country stakeholders’ ability to accurately assess precipitation’s role as shock or stressor for which a community must plan for. By having a spatial continuous dataset to use globally, this will also provide a common structure for decision-making regardless of the geographic interest of a Mercy Corps team. This spatially continuous dataset will provide Mercy Corps with a new, holistic view of resiliency that could provide lessons learned around shared characteristic between geographically-divided communities dealing with similar issues.

**Project Timeline & Previous Related Work**

***Project Timeline:*** 1 Term: 2017 Summer

***Related DEVELOP Work:***

2016 Summer (Langley) – Middle East Water Resources: Utilizing NASA Earth Observations to Create a Precipitation Climatology for Jordan to Enhance Rainfall Monitoring and Management