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1. Introduction

The first-ever Afghanistan weather hazards product was developed in collaboration between NOAA's Climate Prediction Center (CPC) and the United States Air Force. Initially, the product supported the critical needs of the DoD's Air Force by providing week-2 weather guidance in southwest Asia. However, the product has evolved to aid humanitarian efforts for the Famine Early Warning System Network (FEWS-NET) of the U.S. Agency for International Development (USAID). The Afghanistan weather hazards product is created each week and focuses on the following weather hazards: drought, flood, strong winds, blowing dust, extreme heat, and extreme cold. Multiple sources of information, including climatology, real-time observations of temperature and precipitation, satellite data, and numerical weather models are used to prepare the product. Currently, the goal is to alert FEWS-NET personnel of potential hazardous weather situations and any issues that impact food security.

2. Development

During the winter of 2001-02, the Weekly Afghanistan Weather Hazards product was developed by NOAA meteorologists at the Climate Predictions Center (CPC) to support the United States DoD. At that time, the Air Force was making short-term weather forecasts in support of their operations and the CPC hazards product fulfilled a critical need at the week-2 timeframe. Since a week one weather forecast was already prepared by the U.S. Air Force, CPC meteorologist focused on the time period of day 8 – 14. Air Force meteorologists made suggestions on weather conditions that could be hazardous to personnel and transportation.

After a one-year operational process in collaboration with the Air Force, the military requirements in the region were downgraded and the dominant issue became food security and capacity building in the area. The hazards product was transformed into a document to be used primarily by the U.S Agency for International Development for humanitarian needs, including food distribution and transportation. The weather hazards were expanded to include flood potential, short-term drought, and long-term drought. The time period of the hazards assessment shifted to a one week outlook but incorporated the long-term historical elements, e.g. multi-year drought.

CorelDraw, a graphics software package, was first used to develop the hazards image and associated text. During the past year, ArcGIS software has become the primary graphics package used to assemble the hazards product.

3. Afghanistan Climate

Afghanistan is classified as a desert steppe climate that experiences precipitation and temperature extremes associated with elevation changes. The wet season generally begins during the late fall and continues into the early spring. The greatest amounts of precipitation, in the form of rain and snow, occur during the winter. Temperatures vary greatly from winter to summer. During the winter, the highest elevations of Afghanistan frequently recorded temperatures below 0 °F. Meanwhile, during the summer, temperatures above 100 °F are common in the lowlands of western and southern Afghanistan. Strong winds (above 25 knots) can create intense dust storms, especially during the spring and summer.

The following climate normals, based on the period from 1956-1983, are from the National Climate Data Center: average annual precipitation ranges from 2.03 inches at Zaranj in southwest Afghanistan to 39.06 inches in the northeast mountains at North Salang. At an elevation of 11,043 feet, North Salang received as much as 177 inches of snow. Temperatures varied from -51 °F at Chakhcharan at an elevation of 7162 feet to 124 °F at Zaranj in the southwestern deserts.

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4. Tools in Creating the Document

Preparing the Weekly Afghanistan Weather Hazards requires a constant monitoring of past and current weather conditions across Afghanistan and surrounding areas. First, year-to-date precipitation deficits are recorded and compared to a 20-year base period. Ample data from the surrounding countries of Turkmenistan, Tajikistan, Uzbekistan, Pakistan, and Iran enable a meteorologist to diagnose drought conditions for the immediate area. Ground-truth reports and some surface observations within Afghanistan provide additional insight. In addition, daily Afghanistan precipitation estimates are determined using include surface-based rain gauge data from the GTS network, microwave satellite precipitation estimates from the AMSU-B and SSM/I polar orbiting instruments, and geostationary satellite infrared precipitation data based on the GOES Precipitation Index method.

Second, current weather conditions of precipitation and temperature patterns must be monitored using satellite and surface observations. Real-time surface observations from Kandahar, Bagram, Karshi-Khanabad, and Jacobabad are accessible from the Air Force. A current gridded analysis of snow depth (45 km resolution) was developed by the Air Force Weather Agency and is frequently used during the wet season. Also, an awareness of the evolving upper-level weather pattern is needed. Knowledge of the climatology and current weather conditions is mandatory to adequately assess potential weather hazards.

After the aforementioned analyses are completed, model solutions, primarily NCEP's Global Forecast System (GFS), are investigated. Forecast guidance on precipitation, temperature, and winds are offered by the GFS output. The broad knowledge of past and current weather in southwest Asia coupled with model guidance enhances a meteorologist's ability to create an accurate weather hazards document for Afghanistan. In addition, the CPC provides a daily suite of forecast products for the region out to 14 days.

5. Hazards Product

Each week, the appropriate weather hazards are highlighted and labeled on a map of Southwest Asia, centered on Afghanistan. Using GIS software, overlays of political boundaries, roads, rivers, orography, and crop areas can be added to the hazards graphic. In addition to the graphic, a written text including a brief synopsis and description of each weather hazard is distributed by the author. The graphic and adjoining text are located at: <http://www.cpc.ncep.noaa.gov/products/fews/AFGHANISTAN/hazards.html>. The website is updated at 3 pm EST on each Wednesday.

6. Purposes/Future Goals

The initial purpose for the Afghanistan weather hazards was to support efforts of the United States Air Force across southwest Asia. However, during the past two years, the purpose changed to aid humanitarian efforts across the Afghanistan region. A comprehensive suite of products, including the valuable Weekly Weather Afghanistan, was developed. The suite of useful products details information that extends from the current situation out to seasonal forecasts. The suite of products are updated frequently and are available at the following website: <http://www.cpc.ncep.noaa.gov/products/fews/AFGHANISTAN/>

The primary future goal is the improvement in forecasting weather hazards that affect the Afghanistan's population and agriculture. A more timely and accurate weather hazards product will facilitate the U.S. Agency for International Development in their critical humanitarian efforts. The recent use of ArcGIS software in the development process of the product will allow the author to provide additional geographic detail, further enhancing the usefulness of the product. As the product continues its evolution, a better understanding and depiction of Afghanistan's many weather hazards will be met.