AVALANCHE FORECASTING IN THE CENTRAL ASIAN COUNTRIES OF AFGHANISTAN, PAKISTAN AND TAJIKISTAN

Doug Chabot[1]* and Aysha Kaba[2]

[1] Gallatin National Forest Avalanche Center, Bozeman, Montana
[2] Focus Humanitarian Assistance, Toronto, Canada

ABSTRACT: Home of the Karakorum, Hindu Kush and Pamir mountains, Central Asia has a serious avalanche hazard. A single 2012 avalanche cycle resulted in over 100 fatalities. In response to this tragedy, Focus Humanitarian Assistance (an affiliate of the Aga Khan Development Network) developed a strategy to reduce fatalities in these remote areas. First, they conducted a hazard, risk, and vulnerability inventory in FOCUS' area of operation in Afghanistan, Pakistan and Tajikistan, revealing 571 villages with a high avalanche risk. They followed this up by training their field staff, publishing an avalanche manual (2014), and equipping and offering annual training to local Snow and Avalanche Rescue Teams. For the 2015-16 season, FOCUS established 82 manual Weather Monitoring Posts to aid in avalanche forecasting for the highest-risk villages. Observers record daily weather and avalanche activity and post this information centrally online so a US-based forecaster can advise field units about current avalanche potential. This system allows FOCUS to determine when avalanche danger is rising, when a village should be evacuated, and when people can return to their village. Since the program has been implemented, villages have been evacuated hours before getting hit by massive avalanches, thereby saving lives. The people in these remote villages have experiences that are almost unimaginable to westerners, such as being blown to safety across rivers by the air blast of an approaching avalanche or knowing that herds of goats walking in starting zones early season (much like boot packing) is a good thing. This entire community-based program relies on simple, low cost solutions: manual weather stations, rules of thumb and basic avalanche awareness training at the local level.

KEYWORDS: FOCUS, avalanches, community training, weather monitoring, education

1. OVERVIEW

Mountain communities throughout Central Asia (Pakistan, Afghanistan and Tajikistan) experienced a widespread avalanche cycle in March 2012 and again in February 2015 that destroyed villages, killed livestock and took the lives of hundreds of residents. The developed world has the financial and technical resources to effectively manage avalanche risk, but this is not the case in the rugged mountains of Central Asia. The avalanche problems are unique and deadly, requiring simple, sustainable, and inexpensive solutions.

Corresponding author address:

Doug Chabot, Gallatin National Forest Avalanche Center, 10 E. Babcock St., Bozeman, MT 59715; +1-406-581-1110; dchabot@fs.fed.us; skype: doug.chabot

Focus Humanitarian Assistance (FOCUS) is a disaster risk management agency that helps vulnerable communities build resilience to natural and man-made disasters, mostly in south and central Asia. The 2012 avalanche cycle prompted FOCUS to start a program to reduce avalanche fatalities in vulnerable villages through a community avalanche education program, a community training manual on Snow Avalanche Risk Management, mapping the avalanche terrain to identify high risk villages, building Weather Monitoring Posts to collect daily weather and avalanche observations, and hiring an avalanche specialist to analyze the daily weather data and train the community trainers in avalanche safety and weather monitoring.

The mountain communities of Central Asia experienced heightened levels of avalanche activity in tail-end of the 2012 winter season. On

Country	# Districts at risk	# Villages at risk	Total # of avalanche zones	Total population at risk
Afghanistan	16	180	501	22,477
Pakistan	8	226	1,076	2,229
Tajikistan	8	165	442	5,183
Total	**32**	**571**	**2,019**	**29,889**

Table 1. Analysis of the Hazard and Vulnerability Risk Assessments indicates that a total of 571 villages (with a population of 29,889, 75% in Afghanistan) are prone to avalanches across the three countries.

March 5, 2012, an avalanche destroyed the village of Dispay in the Shukai District of Afghan Badakhshan, killing at least 50 people. A week later, on March 12, an avalanche buried 13 families in eastern Nuristan province in Afghanistan, killing at least 45 people.

A week after that on March 19, an avalanche hit the remote Qurqulti Village in northwestern Gilgit in Pakistan, killing four members and injuring three members of the same family. The valley received heavy rain and snowfall over the 48 hours prior to this event. Five members of another family were killed on the same night in Waht Village near Chitral in Pakistan, after an avalanche hit their house. As a result of record snowfalls, nearly twenty avalanches struck villages through Tajik Badakhshan during the last two weeks of March, damaging and destroying several houses and other facilities and killing at least one person and fifty cows.

This 2012 avalanche cycle prompted FOCUS to begin educating their teams of disaster relief specialists about avalanches. In 2014 FOCUS wrote a community training manual on avalanches which has since been translated from English into Urdu and Dari. It is designed to educate and train community members in the avalanche prone areas of Central Asia. The manual is broken into seven chapters, each one explaining a topic relevant to community members about avalanches. Even for those illiterate, the manual has sections on hands-on activities for trainers to teach the avalanche basics.

In February 2015 hundreds more were killed in avalanches throughout Central Asia when a powerful storm dropped meters of snow onto a thin snowpack plagued with depth hoar. At that

time, FOCUS had an early warning system in the most vulnerable villages which utilized an avalanche forecaster in the US for advice on evacuations and rescue during the avalanche cycle. Dozens of villages were evacuated before large avalanches destroyed homes and buried roads.

Starting zones in the mountains of Central Asia are often thousands of meters above the villages. It is impossible to get snowpack data from these areas so forecasting relies heavily on identifying avalanche terrain, getting current mountain weather and noting recent avalanche activity. In 2014 FOCUS created avalanche maps that identified 571 high risk villages (Tbl. 1). This allowed FOCUS to concentrate avalanche education efforts on these villages through their Community Emergency Response Teams (CERTs) consisting of local volunteers trained in life-saving, disaster relief measures. Additionally, in 2015 FOCUS established 82 Weather Monitoring Posts in the three countries. Daily weather is manually collected by a trained villager which is then relayed via cell or satellite phone or CODAN radio to each country's regional center and posted online for a US based forecaster to analyze. If the predetermined alert thresholds are met (i.e., snowfall amounts, rain, avalanche activity) and weather is predicted to increase the danger further, FOCUS begins organizing an emergency response in preparation for potential avalanche activity.

2. AVALANCHE READINESS PROGRAM

Avalanche readiness has been a key component of FOCUS' Community-Based Disaster Management Program (CBDRM) implemented in the mountainous areas of Afghanistan,

Pakistan and Tajikistan. Based on data gathered from the above mentioned countries, risk from snow hazards has proven to be very high in recent years. Given this elevated risk, FOCUS units implemented a comprehensive risk anticipation and community preparedness program in order to reduce the adverse impact to vulnerable communities.

2.1 Program Objectives

The overarching goal is to improve avalanche risk management across FOCUS units and in the communities which they serve. The specific program's objectives are:

- To better understand hazards, vulnerability and risks for all priority avalanche prone areas in the three regions;
- To develop effective early warnings systems for communities;
- To enhance public education and awareness on avalanche risk management for target communities through information sharing and training;
- To enable communities to monitor avalanche risk;
- To strengthen FOCUS and CERT response capacity in the face of avalanche occurrence;
- To position monitoring and rescue equipment in avalanche prone sites.

2.2 Vulnerability criteria

Vulnerable communities in avalanche zones are prioritized based on the following considerations:

- Villages with a high population density (i.e., represent the greatest threat to human life);
- Presence of critical infrastructure in the village (i.e., water channels, cultivatable land); damage which may affect the lifelines and livelihoods of the community and;
- Potential for access issues through either blocked/damaged transportation infrastructure (i.e., roads, bridges) or

where limited transportation infrastructure exists.
- Villages that are expanding and where public investments are increasing.

2.3 Program Activities

Based on the above objectives, Pakistan, Tajikistan and Afghanistan FOCUS units have set the following critical measures into motion:

- Identification of all avalanche zones based on the Hazard, Vulnerability and Risk Assessment (HVRA) maps categorized as "high frequency and high intensity".
- Through mass awareness programs, education to communities on avalanche-prone areas, dangers, early warning signs, safe havens and safe routes to those safe havens;
- Training of CERTs using the standardized avalanche curriculum on topics such as early warning signs, basic snow rescue and the use of rudimentary measurement tools to quantify avalanche risk;
- Verification and, where required, strengthening of stockpiles near avalanche-prone areas, enhanced with avalanche safety equipment including (but not limited to): probes, transceivers, shovels and winterized tents.
- Development of an archive to categorize avalanche incident data.
- Assigning dedicated staff members in each unit to be responsible for data management, reporting and to carry-out daily monitoring of weather patterns and report to the Emergency Response Officer.

2.4 External Coordination and Technical Support

FOCUS has sourced an avalanche specialist to help develop short and medium-term plans to mitigate against the risk of avalanches in the highest risk areas. With the assistance of this technical expert and the gathering of existing material from the three FOCUS units, the FOCUS Global Office has developed a

standardized training module to be delivered to CERTs in each country. The training focuses on avalanche monitoring and assessment techniques as well as the use of basic measurement instruments. Broad topics covered in the training include: defining avalanches and their ingredients, identifying avalanche terrain, the effects of weather on snow stability, forecasting avalanche danger using weather information, preparedness, mitigation and response considerations (including evacuation, basic search and rescue along with rescuer safety), as well as avalanche reporting.

3. WEATHER MONITORING POSTS

A total of 82 Weather Monitoring Posts (WMPs) were activated in January 2015 (17 in Afghanistan, 45 in Pakistan and 25 in Tajikistan). Each WMP site collected and reported weather data on a daily basis which was analyzed by a US-based avalanche forecaster who has been working with FOCUS as a consultant since 2012. Weather parameters included, observations of avalanche occurrence, maximum and minimum temperatures, 24 hour snowfall amount, total snow depth, wind speed and direction as well as 24 hour rainfall amount.

This new community-based weather program has allowed FOCUS, along with the communities it serves, to better understand weather and avalanche patterns which have not been identified in previous years. A number of key learnings from this season are:

- Cross-border data sharing:
  - o Snowfall and corresponding avalanche activity were both tracked by area and compared amongst areas within and between countries. The information was centralized and collected daily to allow for effective analysis.
- Weather Patterns:

  - o Rather than relying on 'guess-work' to determine if avalanches in these areas are triggered by rain on snow, observed rainfall data from WMPs demonstrated that this was in fact an alert threshold which triggered slides.
- Use of the WMP data:
  - o FOCUS regional offices and villages communicated daily which allowed trained teams to ask probing questions and advise on precautionary measures in a timely manner. A capability assessment of field teams indicate they are well skilled to interpret the WMP data they gather which provides them with valuable, life-saving information.
- Well-timed evacuations were carried out as response teams had access to a complete weather data which served as a trigger for early warning when alert thresholds were met.
- Data output from the WMP site nearest to Susum village in Chitral assisted teams in determining if more wet avalanches would occur following a catastrophic slide on March 19 that killed 8 teenagers walking home from school. This data was critical for rescuer safety as recovery efforts were underway.

4. SUMMARY

During the winter of 2012 and 2015, the Afghan Badakhshan, Tajik Badakhshan and northern Pakistan regions experienced numerous snow avalanches resulting in loss of life and assets in target communities. Since avalanche impact can be mitigated through the use of basic measures, FOCUS has implemented programs to reduce risks and attempt to circumvent the losses faced in 2012 and 2015.