I. Monsoon Season in Nepal

People in Nepal are accustomed to adapting to the seasonal changes the monsoon brings to their lives. This includes changes in movement of people and goods, adjustments to livelihood methods, and challenges in terms of storage of assets that need to be protected from damp and wet conditions and the risk of flooding. The timing of the earthquake just prior to monsoon season means that challenges this year will be greater than usual and that the capacity of communities and households to be prepared for the monsoon will be stretched. The impending monsoon increases the urgency for humanitarian stakeholders to respond as rapidly as possible prior to the onset of the rains and to find ways to modify response during the monsoon to continue to meet the most urgent needs.

According to data from the Indian Meteorological Department (IMD), the 2015 monsoon is forecast to arrive in the southeastern part of Nepal around 5 June, and to spread westward across the country by 20 June (AGU Landslide Blog 20/05/2015). The monsoon lasts for an average of 105 days, with much higher rainfall experienced in the eastern region compared with the western region, with a peak in the central region (Sigdel and Ikeda 2012, Ichiyanagi et al. 2007). This means that, of the districts highly-affected by the earthquake, the monsoon will reach Okhaldhunga, Sindhuli, and Ramechhap first, followed by the central region (Dolakha, Khabrepanchok, Kathmandu, Bhaktapur, Lalitpur, Makawanpur, Sindhupalchok, Nuwakot, Rasuwa, Dhading), and will reach Gorkha last. In terms of agro-ecological zones, the hills receive higher annual rainfall than the mountains (Panithi et al. 2015). 80% of Nepal’s annual rainfall occurs during the monsoon period (Neupane 2008). When the monsoon withdraws it moves from west to east, the opposite sequencing of the onset (Gautam and Regmi 2013). Long-term trends point to a delayed withdrawal, which would see monsoon rains lasting progressively later into the year (Panithi et al. 2015).

Nepal - Earthquake: Average Monthly Precipitation for May to August
Based on conditions in the Pacific Ocean, the Indian Ocean and the weak El Niño this year in the central Pacific, a below-normal season for rainfall is forecasted in the region (The Weather Network 28/04/2015). However, in mild monsoons, the Middle Hills region typically experiences more rainfall (Petley et al. 2007) and the Mountains and Hills are the regions prone to landslides. Thus, a lower overall rainfall should not be assumed to bring fewer concerns in terms of landslides and their consequences.

**Landslides**

Nepal is prone to landslides due to its mountainous terrain and these risks increase during monsoon season. The distribution of daily precipitation can be uneven, with some intense days of heavy rainfall thought to play a crucial role triggering landslides (Dahal and Hasegawa 2008).

Landslide risks have been further exacerbated by the earthquake and subsequent aftershocks, which have destabilized slopes, making the areas affected more susceptible to landslides when the monsoon season arrives (Faris and Wang 2014).

Data compiled concerning the frequency of landslides in Nepal between 2004 and 2014, shows that there is typically an increase in landslides early June, which intensifies toward end June, and begins to decrease in early October (AGU Landslide Blog 20/05/2015). The earthquake-affected districts are particularly prone to landslides (AGU Landslide Blog 20/05/2015). The mountainous region along the Nepal-Tibet border, which is also the most inaccessible due to distance from roads and rugged terrain, has the highest risk of landslides (University of Michigan 28/04/2015). Over 3,000 landslides have been reported since the earthquake (ICIMOD DIMS 25/05/2015).

A dry landslide in the early morning of 24 May in Myagdi district in the Western region blocked the Kali Gandaki river for 15 hours, posing a flood threat to downstream communities in Baglung, Parbat, Gulmi, Palpa, Syangja, Tanahun, and Nawalparasi districts (Nepali Times 24/05/2015). The government mobilized an army helicopter and 100 personnel and was able to evacuate people to higher ground in anticipation of a potential dam burst. The river has since begun flowing again, and no casualties have been reported. Incidents such as this are likely to be common in the days ahead, and already limited aircraft resources may be diverted from the earthquake relief efforts in highly affected districts.

**Floods**

The landslides that have already occurred, combined with the greater risk of further landslides during the monsoon, also increase the risk of flooding. Floods are yearly occurrences in Nepal during the monsoon season. There are more than 6,000 rivers and streams in Nepal. Each year, floods cause differing degrees of damage to agricultural land, crops, and human settlements (GRIP 2011).

In early August 2014, monsoon rains triggered a massive landslide in Sindhupalchok district, blocking the Sunkoshi River and causing it to overflow. Securing a controlled release of water proved very difficult as continued heavy rain challenged the response (OCHA 04/08/2014).

Floods and landslides affected people in 21 districts during the monsoon season last year (IFRC 08/09/2014). In addition to Sindhupalchok, other earthquake-affected districts that were affected by floods last year include Gorkha, Rasuwa, Nuwakot, Lalitpur, Dolakha and Sindhuli (ACAPS 09/09/2014). Food stocks and livestock were lost and livelihoods affected, negatively impacting food security (NeKSAP 30/11/2014). 125,000 people were affected, 8000 houses were destroyed and 20,000 damaged (IFRC 08/09/2014). 26,000 people remained displaced one month after the floods (OCHA 08/09/2014).

**II. Potential Impacts on Humanitarian Access**

Changes in access to settlements in parts of Nepal are a regular feature of the monsoon season. However, there is greater concern with access this year due to the instability of roads and the increased number of landslides to date, with more expected. The monsoon will impact access across all clusters/sectors in the delivery of aid.

- Physical access to communities in need and by communities in need:
  - Road access will become increasingly difficult as rains make rural roads muddy, and difficult or impossible to navigate by vehicle. This impacts both the delivery of assistance and community access to services such as health care and markets.
  - Continued landslides pose a risk for blocking roads, taking out bridges connecting villages, and injuring people using mountain footpaths. The capacity to rapidly respond to blocked roads, mountain paths and damaged infrastructure varies.
- Air access is known to become more difficult during the monsoon with a smaller window of safe travel time available. Rain and fog hinder helicopter access to higher altitude areas. Flight details specific to monsoon season were unavailable at time of writing, but flight cancellations are a common feature of air transport in Nepal. In 2014, domestic airlines cancelled 12,675 flights-one third of their total scheduled flights-mostly due to weather conditions such as heavy rain, high winds, or blinding fog (Ministry of Culture, Tourism and Civil Aviation 2014).

- Increased rain and dampness makes safe storage of relief items before and after distribution (medical supplies, food, NFIs) crucial.

- Hydropower plants and highways can be affected by floods and landslides. In the 2014 monsoon season, the Jure landslide in Sindhupalchok in early August affected the communication network, limiting communication with the affected areas. Immediately following the floods, two hydropower plants shut down, reducing the supply of electricity in the area and in Kathmandu valley (IFRC 03/08/2014).

### III. Potential Sectoral Impacts

#### FOOD SECURITY AND LIVELIHOODS

The timing of the monsoon is crucial for agricultural output, as 67% of agricultural land in Nepal is rain-fed. The Central Region, which contains 12 earthquake-affected districts (Sindhupalchok, Rasuwa, Dhading, Ramechhap, Kathmandu, Bhaktapur, Lalitpur, Sindhuli, Nuwakot, Makawanpur, Kabhrepalanchok, Chitwan), is the largest supplier of food grain in the country, contributing a third of total national rice and wheat production (Poudel and Kotani 2013).

Rice, maize, millet and buckwheat are the main monsoon grains. Millet and buckwheat are important in the hills and mountains where agricultural land is limited, and are important crops for the poor (MoAD/WFP/FAO 2012). Rainfall is decreasing in mid and high altitude regions, and models predict that delays in arrival of the monsoon along with an increase in temperatures have significant consequences for wheat and rice production (Poudel and Kotani 2013). This year’s predicted mild monsoon in combination with the destruction of seeds and land caused by the earthquakes, particularly in Dhading, Kabhrepalanchok, Nuwakot, Rasuwa and Sindhupalchok, could cause a significant drop in national grain production, contributing to long-term food insecurity in the coming months.

Grains, seeds, fertilizer, tools and animal feed were lost during the earthquake. The main crop being cultivated at time of the earthquake was wheat, which depending on the location, was still to be harvested, recently harvested and drying outside, or recently stored. Over 80% of grain stored indoors in 11 out of 18 assessed VDCs across 6 districts (Gorkha, Sindhupalchok, Nuwakot, Dhading, Rasuwa and Dolakha) was lost (FAO 22/05/2015).

Livestock, vegetable and fruit production are also important livelihood sources, and many districts have suffered extensive livestock losses from the earthquake (WFP 08/05/2015). Average losses in animal feed of at least 50% were reported in most VDCs (FAO 22/05/2015), and shelter for livestock is a concern as the rains begin. There are local reports of livestock falling sick due to injuries and exposure to rain from being kept in the open. Livestock are critical both as a source of dairy production, in large part for household consumption, as well as for farming power.

Many households, particularly in high altitude regions where migration of men for work is common, depend on purchasing additional foodstuffs to supplement their own food production, which is usually only sufficient for 4 to 6 months (IOM 2010). Communities in larger towns and villages, such as Bhimeswor Municipality in Dolakha, have access to roads, irrigation and markets for their vegetable and potato production (IOM 2010), but the monsoon will hamper access to markets in landslide-prone mountainous regions. Given the earthquake impacts on shelter, health and food stocks, this could put an extra strain on livelihoods above and beyond what is expected for a regular monsoon season.

Households will also have an increased workload due to needing to attend to both their agricultural production and the repair/construction of shelter prior to the monsoon rains.
SHELTER

Durable shelter that adequately protects inhabitants from rain and wind is necessary before the monsoon arrives. Due to the access issues outlined above there is added pressure on ensuring materials to provide this shelter are available in more remote areas prior to the monsoon because once the monsoon arrives delivery will be come much more difficult.

Spontaneous camps that have sprung up in flat urban areas of the valley will be prone to flooding. There will be a need to identify ways to ensure that the food and NFIs people have will not be destroyed by water.

Heavy rainfall and flooding in Chautara, Sindhupalchok in mid-May has already had a negative impact on the living conditions for the displaced population in the municipality (IOM 12/05/2015). It is likely that these pre-monsoon rains have had similarly negative impacts in other districts as well. Conditions in displacement sites are expected to deteriorate during the monsoon season, especially in terms of adequate WASH facilities. Overcrowding is already a concern in the camps (IOM 12/05/2015), and might be expected to further increase as people living in temporary shelters not offering adequate protection against heavy rain might relocate to camps, seeking better shelter as well as access to other services.

Some communities are reportedly demanding information about the safety of their locations in terms of landslide and other natural hazard risks. There are also anecdotal reports that people may move from more remote areas into district headquarters and/or the capital if sufficient relief materials have not reached them prior to the monsoon.

Local media reports indicate that in many places, including Charikot, people have been constructing their own shelters using corrugated iron sheets and nails ahead of the monsoon. Anecdotal reports from Gorkha have claimed a shortage of nails in some remote areas. Support with the tools and materials necessary to assist affected communities in the most remote areas with building shelters before monsoon begins should be prioritized.

HEALTH AND NUTRITION

The monsoon brings with it an increase in several health concerns, particularly water-related diseases such as diarrhoea (Karki et al. 2010). The key concern in relation to health is that the issues regularly identified as problems during the monsoon will be worse than usual this year as a result of the impact of the earthquake in terms of living conditions, water and sanitation and that these will be further exacerbated if access to healthcare is more challenging than usual.

During a 2012 outbreak of acute diarrhoea, cholera was mainly detected between the rainiest period of mid-July to mid-August (Pun et al. 2013). A surge in typhoid cases is normally seen from June to August, when ground water contamination is frequent due to heavy rain (Karkey et al. 2008). Furthermore, acquiring diarrhoea during the monsoon may be a risk factor for prolonged illness in young children (Strand et al. 2012).

Mosquito-borne illnesses, while mostly confined to southern low-altitude districts, are also a concern due to displaced people being more exposed to the outdoors. Dengue fever is thought to be an emerging disease in Nepal, since a 2010 outbreak resulted in 264 cases admitted to hospital between July and December (Pun 2011). Japanese Encephalitis is endemic in 24 districts, including Makawanpur and Sindhuli, and cases usually surge following the monsoon (Bista and Shrestha 2005). Malaria cases, mostly an issue in the Terai, peak either during or after monsoon season and remain a concern for people migrating from hills and mountains to the Terai and India (Dhimal et al. 2014).

Changes in food consumption patterns ahead of the monsoon this year as a result of the earthquake have implications for nutritional status. Protein consumption is reported to have decreased in 10 out of 18 surveyed VDCs in Gorkha, Sindhupalchok, Nuwakot, Dhading, Rasuwa and Dolakha, where people are eating less meat, milk, and eggs due to loss of livestock and market disruption (FAO 22/05/2015).

Women, young children and the elderly are the most vulnerable to health impacts of altered nutrition. There may be infant growth effects of seasonal rainfall and related agriculture outcomes at the household level (Tiwary and Jacoby 2013). There may be a seasonal increase of anaemia risk for pregnant women during the monsoon (Bondevik et al. 2000).

Although detailed information is not available, it is assumed that general access to health facilities will be impeded due to treacherous walking paths in remote mountain areas.
Of the more than 900 health facilities damaged in the earthquake, many are now temporarily operating due to the establishment of facilities in tents (Health Cluster 17/05/2015).

Insufficient medical supplies is a concern (Health Cluster 17/05/2015) which might further deteriorate during monsoon season due to lack of access and the challenges this poses in delivering materials to the more remote of these facilities.

**WATER, SANITATION AND HYGIENE**

The heavy rains during the monsoon season often lead to contamination of water sources with fecal matter, leading to increased outbreaks of waterborne diseases (Pokhrel and Viraraghavan 2004). This increases the urgency of water, sanitation, and hygiene interventions.

The mountainous VDCs have lower coverage of safe water supply and sanitation compared with hills (Nepal Census 2011). As of 2014, 63% of urban households had access to an improved sanitation facility that is not shared, compared with 60% of rural households (MICS 2014). 96% of urban household members use an improved water source compared with 93% in rural areas (MICS 2014). Of households with unimproved drinking water sources, only 13.6% use an appropriate treatment method (MICS 2014), with water treatment being much higher in urban households than in rural households (DHS 2011). In the Central Development Region, which contains the highest number of earthquake-affected districts, overall sanitation coverage was 62.8% and water supply coverage was 85.2% as of mid-2014 (NMIP 2014).

Despite recent significant progress in improving sanitation due to an Open Defecation Free (ODF) initiative by the government, damage from the earthquake may set some districts back. Prior to the earthquake, Gorkha, Bhaktapur, and Makawanpur were already declared ODF, and two more were set to declare ODF this month (Dolakha and Sindhupalchok) (NMIP 2014). 32.1% of VDCs (235) across the 14 highly affected districts were designated as ODF previous to the earthquake (DWSS 20/01/2014). Ramechhap and Nuwakot were districts considered less developed in terms of sanitation prior to earthquake.

The earthquake has resulted in an estimated loss of more than 180,000 household toilets (NMIP 2014). People from these ODF areas are demanding toilets, and in many cases repairing and building them where materials are available.

Movement of people in remote areas into district headquarters and the capital is anticipated ahead of the monsoon, which could be expected to be a sanitation issue. Needs that arise as a result of populations congregating will require rapid responses, including the management of defecation areas and/or provision of toilets. Schools, health facilities and IDP sites are a priority for repairs and/or construction of toilets. Monitoring health surveillance for outbreaks of diarrhoeal disease will be necessary to prioritize quick response with sanitation and hygiene interventions as rainfall increases.

**EDUCATION**

As of 17 May, 6902 schools have been affected, and 16,475 classrooms are completely damaged (Department of Education). The earthquake occurred close to exam time, leaving many secondary students unable to finish the current school year. Schools in the hill and mountain regions which comprise the most affected districts are normally in session throughout the monsoon period, with no major school breaks until the festival of Dashain, which usually falls around October. An estimated 999,000 children are estimated to be out of school due to the earthquake (Education Cluster 25/05/2015).

The government plans to resume school using Temporary Learning Centres (TLCs), combined with reopening schools that did not have damage, by 29 May. A shortage of materials for construction of TLCs is anticipated in many areas, and it is likely to take weeks to set up a TLC with a toilet for each damaged school. Communities eager to resume school may attempt quick repairs of damaged buildings with insufficient planning and limited budgets, which may result in unintentionally unsafe structures. Safe, flat spaces for these TLCs must be identified in cases where damaged schools are at risk of landslide or flooding.

During monsoon, access to schools in more remote communities usually declines due to dangerous mountain trails and overflowing streams. The earthquake has created further instability by increasing landslide risk. It is expected that this may make parents less likely to be willing to send their children to school.

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1 Bhaktapur(16), Dhading(10), Dolakha(9), Gorkha(60), Kabelrepalanchok(20), Kathmandu(16), Lalitpur(3), Makawanpur(43), Nuwakot(1), Okhaldhunga(4), Ramechhap(1), Rasuwa(2), Sindhuli(7), Sindhupalchok(50)

2 The approved design consists of tarpaulins over bamboo frames, with bamboo walls for dividers. A shortage of funds and/or materials will make it difficult to build as per design in the timeframe expected.
The earthquakes and continued tremors have caused population movement, including students migrating to the Terai and India, as well as children coming back to their villages from Kathmandu. A population of students in flux for the coming months will make planning for education needs challenging.

Difficult living conditions due to inadequate shelter, in addition to the trauma faced by children may impact health negatively, and contribute to absenteeism from school. Those children who do resume school will likely have less time in class, as schools will need to run double shifts and share space, which may have a negative impact on learning outcomes. The rainy season in combination with inadequate shelter will make it difficult to store school supplies such as notebooks and uniforms in a dry place.

Nepal has a high pre-earthquake primary level dropout rate of 26%, 6.5% for lower secondary level, and 6.9% for secondary level (DoE 2011-12), for a variety of reasons including accessibility, affordability, quality, and relevance (Wagle 2012). After disasters disrupt education, children are more likely to drop out of school (Tuladhar et al. 2013). The monsoon season, in combination with lack of enough TLCs, is likely to keep many children out of school.

Expected access issues during the monsoon season will limit protection monitoring.

The Dalit population, who constitute about 13% of the population, is vulnerable due to marginal social standing and because they live apart from mainstream settlements (IDSN 2012; ACTED 28/04/2015). Many indigenous groups and religious minorities are also similarly marginalized. There are concerns that they might miss out on relief and that this may not be easy to know about unless the communities are contacted directly.

In remote areas many people lack citizenship papers, identification, birth registration and land ownership, and in many cases have lost some or all documents in the earthquake. Concern has been raised that people without citizenship documents might miss out on aid. Difficulty in travelling during monsoon season will make it hard for those seeking compensation from the government for earthquake damages to reach the relevant government officials from remote areas.

In many villages, the majority of working-age men are migrant workers abroad, leaving women, children, and the elderly in charge of the recovery efforts. Social practices may make it difficult for female-headed households to access relief items. Female-headed households may be at a disadvantage in terms of clearing rubble, salvaging materials, and repairing their homes, as they will simultaneously need to be attending to agricultural tasks ahead of the monsoon.

Women and girls are disadvantaged by traditional social practices in different areas, such as son-preference, stigmatization of widows, seclusion of women, and segregation of women and girls during menstruation (CARE 05/05/2015). The earthquake is expected to further worsen the conditions for women and girls, in particular in terms of lack of access to safe WASH services.

Child marriage is still an issue in Nepal, although the age of first marriage for females is increasing over time. As of 2011, the proportion of women aged 15 to 19 who were married by age 15 was 5%, compared with 24% of women aged 25 to 49 (DHS 2011). Dowry is a major driver of child marriage (CARE 05/05/2015). There are concerns that numbers of child marriages might increase post-earthquake as a means to ease financial burden.

People trafficking is another protection concern, as an estimated 15,000 women and children become victims to trafficking each year (ActionAid 07/05/2015). With increased economic vulnerability following the earthquake, there are concerns that this number will increase. Most of the earthquake-affected areas are among those districts considered particularly prone to trafficking of women and children, including Dhading, Gorkha, Kathmandu, Kabhrepalanchok, Lalitpur, Makawanpur, Nuwakot, Ramechhap, Rasuwa, and Sindhupalchok (American Bar Association, 07/2011). Makawanpur district is connected with two major highways (Tribhuvan Highway connecting Kathmandu with Birganj near the Indian border, and the East-West Highway which runs across the country and through Kathmandu). 50% of Makawanpur’s population are indigenous Tamang, who are a historically marginalized ethnic group and prone to trafficking (American Bar Association, 07/2011). Past disasters in other contexts have shown that the disruption to societies that takes place in disasters as well as financial pressure can exacerbate these kinds of underlying vulnerabilities.

There have already been some reports of sexual violence incidents within camps in Kathmandu (ICC 03/05/2015). Limited operational services to respond to cases of sexual and gender-based violence have been reported (OCHA 04/05/2015).

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3 Refer to annex Table 1 for district-wise % of marginalized population.
Table 1. District-Wise Percentage of Marginalized Population*

<table>
<thead>
<tr>
<th>District</th>
<th>% Marginalized Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhaktapur</td>
<td>2.33</td>
</tr>
<tr>
<td>Dhading</td>
<td>17.5</td>
</tr>
<tr>
<td>Dolakha</td>
<td>17.9</td>
</tr>
<tr>
<td>Gorkha</td>
<td>20.7</td>
</tr>
<tr>
<td>Kavre</td>
<td>6.85</td>
</tr>
<tr>
<td>Kathmandu</td>
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<tr>
<td>Lalitpur</td>
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</tr>
<tr>
<td>Makawanpur</td>
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</tr>
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<td>Nuwakot</td>
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<tr>
<td>Okhaldhunga</td>
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<td>Ramechhap</td>
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<td>Sindhuli</td>
<td>15.8</td>
</tr>
<tr>
<td>Sindhupalchok</td>
<td>17.6</td>
</tr>
</tbody>
</table>

*Includes the following ethnic/caste groups: Hayu, Thami, Chepang, Badi, Chamar/Harjan, Damai, Dhobi, Kami, Kumal, Majhi, Sarki, Other Dalit
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