

Young Researcher

Rejuvenating research among young aspiring minds

Monsoon in Nepal



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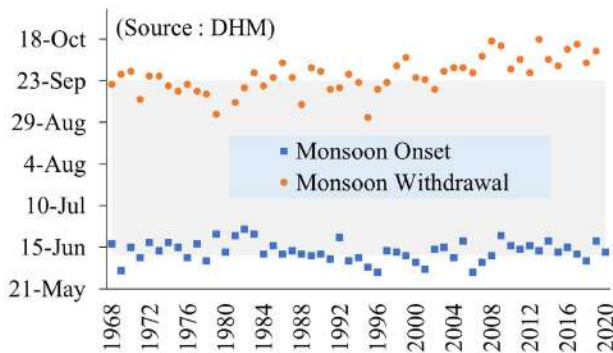
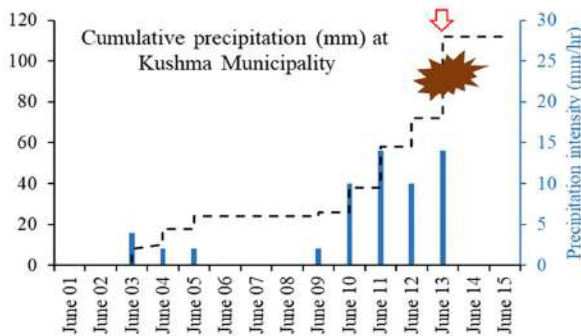


Figure 1: Monsoon onset and withdrawal



Landslide at Kushma Municipality Ward 03, Parbat on 2020 June 13
2020 June 12

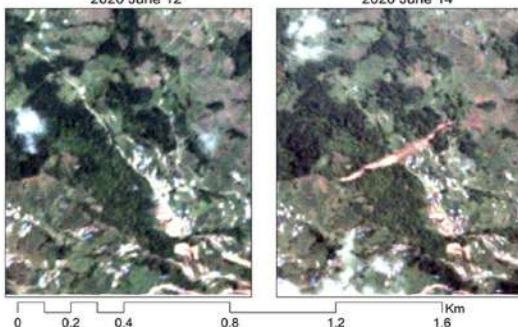


Figure 2: Kushma municipality, Parbat landslide, and resulting debris flow

Reference:

Nayava JL. 1980. *Rainfall in Nepal. The Himalayan Review. Nepal Geological Society, 12.*

The word “Monsoon” comes from the Arabic word “*mausim*” meaning season or shift in the wind flow. It is accompanied by a dramatic increase in precipitation. Monsoon can be both boon and bane. Extreme precipitations during monsoon season often result in major water-induced hazards, such as floods, landslides, and debris flow. However, the monsoon season is equally vital to agriculture and the economy. Because a delayed onset (start of monsoon) or reduced precipitation can have a devastating effect on the livelihood of almost 3/4th of the population that is dependent on agriculture.

The nature of the precipitation—its amount, temporal variability, intensity, frequency of occurrence, and spatial variation is a major factor affecting agricultural potential. Monsoon is not continuous but continual rain for a few days is separated by rainless intervals. In Nepal, summer monsoon starts normally from June 10 and ends on 23 September.

The country receives more than 80% of its annual precipitation during the monsoon season. The rice plantation period normally begins in early May in the hills and June in the Tarai, the country’s food basket. The monsoon precipitation is directly linked with the country’s agriculture and in turn, the economy. This year (A.D. 2020) monsoon entered into Nepal on 12th June. A long term temporal evolution of monsoon onset and withdrawal (Figure 1) shows that a delayed monsoon withdrawal coupled with either altered or unchanged monsoon onset is observed. Monsoon periods are, in general, found to be longer in recent times. On average, 6-7 monsoon depressions (twice per month) move in a year, corresponding to a period of about 17 days (Nayava, 1980). When the monsoon trough (large depression) moves closer towards the foothill of Nepal (we call it active break-monsoon), heavy precipitation related extreme events usually occur in part or whole of Nepal. During such extreme precipitation events, floods (river floods, flash floods, urban floods) are likely to occur. The timing of flood/inundation and early warning mechanisms are crucial for effective mitigation of flood risks however the likely locations of flood-prone areas are, to some extent, predictable.

But, the landslides and debris flow can sometimes even occur at low susceptible areas. A recent example of a landslide followed by a debris flow at Kushma municipality, Parbat on June 13, 2020 highlights that the terrain which never experienced a landslide before encountered such a disastrous event affecting lives and property. Figure 2 shows a preliminary assessment of cumulative precipitation derived from hourly precipitation data of a satellite-based product, PERSIANN CCS (spatial resolution, 4 km) and the spatial location of landslide/debris flow before and after the event using Planet Imagery (spatial resolution, 3 m).

A single event with intense precipitation for a short period can even bring urban inundation, land/mudslide, or flash flood. Therefore, it is high time to map possible hazards and prepare for worse scenarios. **You can’t manage what you don’t measure.** A citizen-science based precipitation measurement can even be taken as a reference to correct satellite-based precipitation. Let’s measure.

2021 UN climate change conference (COP26) rescheduled for Nov 2021

The Bureau of the Conference of the Parties to the UNFCCC (United Nations Framework Convention on Climate Change), on 28 May 2020, decided that the 26th session of the Conference of the Parties (COP 26) to the UNFCCC, which was originally scheduled to take place from 9-19th November 2020 in Glasgow, UK, would take place from 1-12 November 2021, in the same venue. The press statement released by the UK government stated, "In the run-up to November 2021, the UK as hosts will continue to work with all involved to increase climate action, build resilience and lower emissions. The new date will also allow the UK and our Italian partners to harness our incoming G7 and G20 presidencies in driving climate ambition."

June 3

<https://thehimalayantimes.com/lifestyle/environment/2021-un-climate-change-conference-cop26-rescheduled-for-nov-2021/>

Hog badger (*Arctonyx collaris*) found in Syangja, Nepal

According to the Forest Division Office of Syangja, a hog badger (*Arctonyx collaris*) was spotted in Walling municipality, Syangja. The animal with pink snout similar to a pig, body covered with thick black and white hairs, and long nails were found by villagers and reported to the Forest Division Office.

June 16

<https://www.karobardaily.com/news/country/32952h-heat-may-reading/>

The Arctic is on fire: Siberian heat wave alarms scientists

The Arctic is feverish and on fire — at least parts of it are. And that's got scientists worried about what it means for the rest of the world. The thermometer hit a likely record of 38 degrees Celsius (100.4 degrees Fahrenheit) in the Russian Arctic town of Verkhoyansk on Saturday, a temperature that would be a fever for a person — but this is Siberia, known for being frozen. The World Meteorological Organization said Tuesday that it's looking to verify the temperature reading, which would be unprecedented for the region north of the Arctic Circle. Jonathan Overpeck, a climate scientist, said that the Arctic is figuratively and literally on fire — it's warming much faster than we thought it would in response to rising levels of carbon dioxide and other greenhouse gases in the atmosphere, and this warming is leading to a rapid meltdown and increase in wildfires.

June 24

<https://thehimalayantimes.com/lifestyle/environment/the-arctic-is-on-fire-siberian-heat-wave-alarms-scientists/>

1.25MW solar power added to the national transmission system

The Nepal Electricity Authority (NEA) is developing a project capable of generating 25 Megawatt (MW) electricity in Nuwakot. 1.25MW of electricity generated from the solar project has been added to the national transmission system at the sub-station of Devighat Power House. 80-90% of the solar energy is converted into electricity. It will be the largest solar project in Nepal with a capacity of 25MW. A single panel can generate 275W of electricity and each panel covers 2.5 Acre of land. A contract worth Rs. 38 million was signed with the Chinese company 'Risen Energy' to set up the plant under the World's Bank Grid Solar and Energy Efficiency Project.

June 5

<https://www.newsofnepal.com/2020/06/05/323054/>

Dolphins (*Platanista gangetica*) spotted in Kailali Rivers

Gangetic River Dolphins (*Platanista gangetica*), one of the rare species of dolphins, were observed in the Kailali rivers due to the rainfall in the Chure region. Dolphins are being frequently spotted in rivers including Pathraiya, Mohana, and Kandha due to the increase in water level. After the water level drops in these rivers, the aquatic animals migrate to the rivers of Karnali in search of deep water. These dolphins species, placed in the red list of threatened species by the International Union for Conservation of Nature (IUCN), have been protected in Kailali since the year 2000.

June 17

<https://risingnepaldaily.com/nation/dolphins-surface-early-in-kailali-rivers>

Detection of spread of covid-19 by testing sewage water

A study conducted at Yamanashi University in Japan claims to have found the SARS (COV-2) virus in sewage water which helps to estimate the spread of disease in that community. According to Dr. Ocean Thakali, who was involved in the study at Yamanashi University, the virus has been found in the faeces and urine of Covid-19 infected people whether they show symptoms or not. The research was recently published in the world-renowned journal, *Science of the Total Environment*. According to Dr. Thakali, even if corona's RNA is found in sewage water, it will not survive long and is less likely to spread via water due to the small amounts in water. However, those working on the sewage treatment plant have to be careful.

June 26

<https://gorkhapatraonline.com/featured/2020-06-26-17306>

In Africa and Asia women and girls spend much of their time collecting and transporting water for their families.

-Water Youth Network.

By 2025 half the world's people will live in countries with high water stress.

Source: www.seametrics.com

Worlds Pile of Electronic Waste Grows Ever Higher

Electronic goods grew to a record high last year, according to an annual report released Thursday and among all the discarded plastics and silicon, about sixth of it was only recycled. The United Nations(UN)-backed study estimated the amount of e-waste that piled up globally in 2019 at 53.6 million metric tons (59.1 million tons) – almost 2 million metric tons more than the previous year. The discarded electronic equipment also possesses a health and environmental hazard, as it contains substances such as mercury that can damage the nervous system. The authors of the study, which is produced by the UN University, the International Solid Waste Association and others, predicted that global e-waste could grow to 74 million metric tons by 2030.

July 3

<https://thehimalayantimes.com/lifestyle/environment/worlds--pile-of-electronic-waste-grows-ever-higher-study/>

2 Dead and 18 Go Missing As Rain Trigger Flood in Sindhupalchowk

Flooding in Barahbise Municipality in Sindhupalchowk, central Nepal has caused the death of at least 2 people and 18 others went missing. 14 houses were swept away alone in Barahbise Municipality-5 after floodwaters from Almo Thado Khola and Kabre Khola entered the settlements. 11 people were swept away from the area and 2 bodies of 20 years old Nikesh Basnet and his 3 years old daughter were recovered. 9 people are still missing. Another house was swept away in Marming village of Bhotekoshi Rural Municipality by the flooded Balkute Khola. 9 people are still missing. The floods have also caused damage to various road sections and bridges along the Araniko Highway.

July 9

<https://kathmandupost.com/national/2020/07/09/15-houses--washed-away-two-dead-and-18-go-missing-as-rains-trigger-floods-in-sindhupalchowk>

Citizen Scientist's Story

Namaste, I am Renuka Karmacharya. I am currently studying Environmental Science in 3rd year at Khwopa College, Bhaktapur. I came to know about S4W-NEPAL through the outreach program conducted in my college and I was inspired to be a citizen scientist. I always wanted to work in the field of water resource management and I got an opportunity to be a part of it. I have been actively collecting daily precipitation data for more than a year.

I have been collecting precipitation data with the help of a cost-effective rain gauge (made up of plastic bottles) provided by S4W-Nepal for free. S4W-Nepal uses modern technologies for the collection and transmission of data using the mobile application Open Data Kit (ODK) collect. This data collection method is relevant and easier to use and also time-saving. Data collection plays a vital role in knowing the past and present status/condition of water in the field and also helps in resource management with solutions to the problems. Data collection of a wide range is not possible only by a single person but with the joint effort of fellow citizen scientists, a small effort of all of us (citizen scientists and local people) can bring a large change in any sector.

Water as a whole for Sustaining Biodiversity

The *American Museum of Natural History* provides insights on biodiversity by defining it as the variety of life on earth at all its levels. Thus, biodiversity ranges from the genetic level to the ecosystem level and can encompass the ecological, evolutionary, and cultural processes that sustain life. In simple words, it is the variety and variation of all living beings: plants, animals, birds, insects, and even bacteria and viruses. We tend to consider biodiversity important for both of its intrinsic and utilitarian values, but how often do we think about what is important to sustain it?

The known fact that water makes up about 70% of the total cell mass, alone is enough to highlight how profoundly water is associated with our lives. Water is also often termed as the 'Elixir' of life and it isn't unknown either, that no life can sustain without it. The right combination of two atoms; hydrogen and oxygen, as simple as it may sound, is what holds the entire planet together. To highlight how water supports biodiversity and is essential for sustaining it, let us take an example of two different environments that exist: Tropical forests and the Tundra biome. Tropical forests are considered to have the greatest species diversity of the terrestrial biomes whereas the tundra biome is considered to have the least. The tropical forests receive about 152 cm to 406 cm of rainfall annually whereas the tundra receives only about 15 to 25 cm of annual rainfall. Also attributed to its temperatures, only a handful of plants and animals can survive in the Tundra biome. However, in the tropics, 7,700 species of plants and 4,400 species of animals have been documented. Also, approximately 170,000 of the 250,000 described species of vascular plants occur in tropical biomes. It is widely believed that life first started in water.



Shreeya Manandhar
Secretary, Young Researchers' Circle

Brian Glazer once stated that wherever water can be found, be it ice-covered lakes or deep-sea hydrothermal vents or arid deserts, we can find forms of life that have found a way to make a living there. All living organisms contain a certain portion of water in them. At a molecular level, water allows everything inside cells to have the right shape. For instance, without water, cell membranes would lack structure and the cell wouldn't be able to keep harmful molecules outside of the cell. It also has a role in the proper functioning of protein and DNA, which are the fundamental components of cells and thus life. Water due to its versatility and adaptability can help perform important chemical reactions within the bodies of living beings, ensuring their survival. It is also an essential element of the photosynthesis process, without which the plants cannot survive, let alone the existence of an ecosystem with thriving biodiversity.

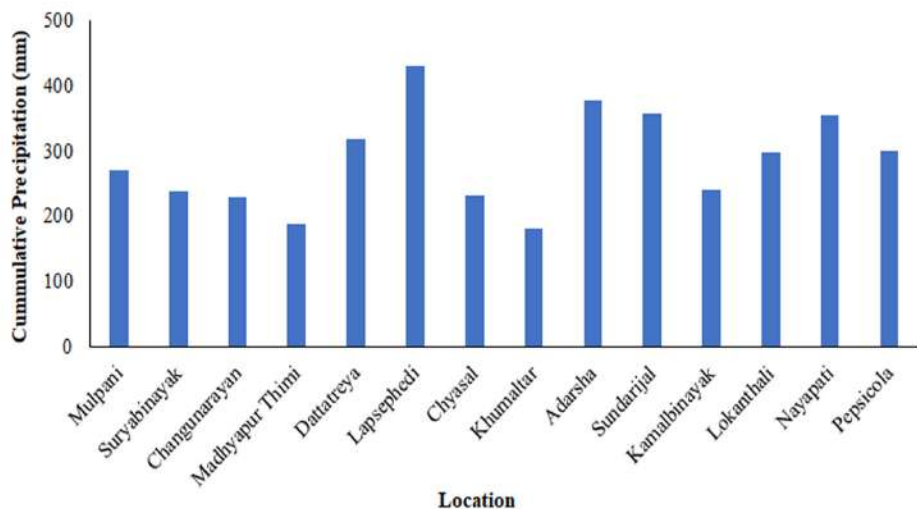
Similarly, it aids in respiration by splitting adenosine triphosphate (ATP) into adenosine diphosphate (ADP) and phosphoric acid; spontaneously releasing cellular energy as a by-product. Attributed to its cohesive properties, long columns of water can be formed and drawn up in vascular tissues of plants, ensuring an adequate supply to different parts of the plants.

Organisms in which fertilization is external, such as some lower plants like algae, fungi, bryophytes and pteridophytes and amphibious animals like frogs require water to complete their life cycle.

Pollination and dispersal of seed can also occur by water bodies in pondweeds (E.g. *Potamogeton clispus*) and waterweeds (E.g. *Egeria clensa*). Pollination also occurs by rain in plants like *Ranunculus flammula*, *Caltha palustris*, and *Nartheicum ossifragum*. Water bodies like rivers, lakes, ponds, oceans, and seas also provide habitats for a wide range of species; from microscopic to macroscopic organisms. Coral reefs found in tropical oceans near the equator are considered to be one of the most diverse ecosystems on the planet. They occupy less than one percent of the ocean floor but are home to more than twenty-five percent of marine life. Generally, aquatic organisms survive by directly breathing oxygen dissolved in water. Without it, they would suffocate; which would account for losing aquatic biodiversity as a whole. Sustaining the diversity of organisms is only possible when the organisms survive in the first place. It is evident that water is essential for the survival of all living beings, given its significance ranging from the molecular level to the level of an entire ecosystem. In conclusion, to ensure the survival of the organisms that maintain the diversity of our planet, one must ensure the proper availability of water for such organisms.

(Note: This was the winning article on the article writing competition organized on the occasion of World Environment Day 2020.)

Cummulative Rainfall of June in the Kathmandu Valley



DID YOU KNOW?



For every \$1 invested in water and sanitation, an average of at least \$4 is returned in increased productivity.

-Water Youth Network

Photo Gallery



Rain gauge construction by YRC member



Citizen Scientist of the month of June - Aastha Phoju

YRC activities

Article writing competition and a video campaign on the occasion of World Environment Day 2020

Publication of weekly 'Environmental News Refresher' and bi-monthly newsletter 'Young Researcher'

S4W-Nepal Activities

Training on Smartphone-based Data Collection Tool

Training on Geographic Information System (GIS) by Mr. Raghu Nath Prajapti

Guest lecture on "Sharing experiences of water-related research" by Dr. Bhesh Raj Thapa on July 07

Guest lecture on "How safe are we from rain water?" by Dr. Rocky Talchabhadel on July 11

Guest lecture on "Application of VIC - a Hydrologic model" by Dr. Keshav Basnet on June 29



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